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Judy —
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in the UISM project file.

Nancy

ABSTRACT

THE FUTURE OF INFORMATION SYSTEMS MANAGEMENT

It has been evident that for some time the information systems function in most US companies has been taking an increasing role in business strategy. As the application of technology becomes more a part of general business strategy, the role of the function and it's top manager must change. Many factors are influencing the scope, responsibilities and organizational structure of the information systems activity as this transition occurs.

Emerging technologies will create opportunities for new kinds of strategic applications, and for new ways of building and managing systems. These technologies will clearly have an impact on how the traditional functions of the information systems organization are performed, as well as who performs them. The availability of a growing portfolio of outside services for everything from processing to systems integration will offer new options to the information systems (IS) executive for fulfilling his or her responsibilities.   And, as the technology becomes increasingly embedded in the business operations, customer and supplier interfaces, management decision making processes and product strategies of business institutions, the shape of the IS function will undoubtedly become differentiated by industry and/or product type.

This study examines how these and other factors are likely to shape the role and structure of information systems over the next decade. It utilizes the results of indepth interviews of over 30 leading IS executives and industry experts to develop a view of the future mission of the IS function and the role that the Chief Information Officer (CIO) is likely to play at the end of the next decade.

LIST OF EXHIBITS

I
Introduction

Forecasting the future is a risky occupation at best. This is particularly true where the variables involved range from rapidly evolving computer based technologies to the cultural characteristics of business organizations and the structures of the industries they serve. The best one can hope for is to identify the key trends and variables that are influencing the future and develop a variety of scenarios or models which are useful as decision making frameworks. This study attempts to do just that. The *future* under consideration is the role and management of information technology, and the time frame is the next decade. Further definition of the study objectives follows.

A
Objectives

The study has four major objectives:

*   To obtain a working definition of the role of the Chief Information Officer (CIO) that would be "typical" in today's environment.

*   To examine how the role differs from industry to industry.

*   To examine the business and technology trends that are affecting the IS function over the next several years.

*   To analyze the impact of these trends and project how the role might evolve over the next decade.

B
Methodology and Scope

1. Methodology

To gather the information for this study, INPUT conducted 33 interviews. Thirty of the interviews were with leading CIOs, and three with acknowledged industry experts. A list of the companies interviewed by industry classification is contained in Appendix A. All interviews were conducted by INPUT senior staff who have broad based experience as top level executives. Thirteen were conducted in person and the remaining 20 over the telephone. The following methodology was employed:

* Each interview candidate was contacted in advance and briefed on the objectives of the study.

* A six page study outline, *IS Management in the Year 2000*, jointly developed by INPUT and Andersen Consulting, was mailed to each interviewee. The outline was designed to stimulate thinking in the eight major subject areas summarized in Exhibit I-1. (A copy of the study outline and the companion questionnaire is contained in Appendix B.)

* One hour interview sessions were scheduled with each interviewee and conducted by INPUT principal consultants and executives.

Exhibit I-1
Topic Areas - CIO Interviews

1. Business Trends	4. Organization/Responsibilities
2. Industry Characteristics	5. Staff Structure/Operational Resp.
3. Information Technology	7. CIO's Role in Enterprise Planning
4. CIO vs. "User" Executives	8. Role of Third Party Providers

The interview sample was selected to obtain the views of some of the U.S.'s leading IS executives across all major industry groups on all aspects of the IS function, both as it presently operates and as they perceive it will operate in the next decade. Exhibit I-2 gives the sample distribution by industry classification. Although an interview guide was used (Appendix B) to insure that all relevant topics were covered, most of the interviews were very unstructured. Several lasted for up to three hours, and most ran between one and two hours.

The mass of information gathered through this process was categorized by issue area and examined from several different perspectives to obtain the conclusions presented in this report. The result is a qualitative, issue oriented, analysis. While the sample size does not permit the development of a statistical case for any of the conclusions reached, there were clearly issues on which the CIOs interviewed responded with almost uniform consistency.

In addition to the data gathered directly through the survey discussed here, the author has incorporated some information drawn from other INPUT research on trends in information systems management which is relevant to the topic at hand. References to this data are given throughout the report.

Exhibit I-2
Sample Distribution by Industry Classification

INDUSTRY CLASS	NUMBER	INDUSTRY CLASS	NUMBER
Financial Services	7	Insurance	3
Telecommunications	3	Retail Distribution	1
Transportation	3	Medical	1
Services	1	Discrete Manufacturing	7
Process Manufacturing	4	Industry Experts	3

2. Scope

The analysis contained in this report deals with all of the topic areas listed in Exhibit I-1. The information gathered during the interview process attempted to capture the interviewees' current and future views on each topic in general, as well as their views on each topic area for their particular industry.

Due to the open-ended nature of the questionnaire, interviewees were not limited to the discussion of any specific set of technology or business trends, although some were suggested in the interview guide as examples. As a result, the analysis covers a broad range of subject areas that relate to the driving forces and trends that will influence the role of IS and the CIO over the next decade.

The study <u>does not</u> attempt to present a quantitative analysis of IS expenditure patterns or forecast hardware and software requirements into the next decade. In some cases, as mentioned earlier, statistical data obtained through other INPUT surveys as been utilized to substantiate trends as appropriate.

C
Report Structure

A brief description of the organization of the remainder of the report follows:

* Chapter II is an Executive Overview providing a summary of the contents of the entire report.

* Chapter III, The Role of the CIO, presents a baseline description of the role and responsibilities of the CIO and the role of the IS function as leading IS executives

see it today. It covers such topics as the objectives of the IS function, critical success factors and the criteria applied in evaluating the CIO.

* Chapter IV, IS Role Structure, identifies the five key responsibility areas that today's IS function must perform. It analyzes the survey data on the basis of industry characteristics, and develops the key product characteristics that determine how IS is likely to be organized in different industries.

* Chapter V, Business and Technology Trends, analyzes the likely impact that key developments in business and technology trends will have both on the role of the CIO and the distribution of IS responsibilities in the future.

* Chapter VI, Future of the Information Systems Function, gives INPUT's analysis of how the information systems function is likely to be organized and managed in the next decade.

D
Related INPUT Reports

Recent INPUT reports of direct relevance to this study include:

II
Executive Summary

This study was undertaken to gain insight into the changing role of the CIO, and to gain an understanding of the organizational structure and responsibilities of the information systems function in the next decade. A variety of factors led to the decision to examine the issues at this point in time.

* It appears that the long forecasted role of information technology is at last becoming a reality. Information systems is actually taking a significant role in the strategy of business in a number of industry sectors, and is clearly having some impact on virtually all major industry groupings.

* Emerging technologies are creating opportunities for new kinds of strategic applications, and for new ways of building and managing systems.

* Consolidation in the information services industry is offering information systems (IS) executives opportunities to buy full solutions, through systems integration; and to farm out all or part of existing operations and maintenance, thus permitting the in-house function to focus on strategic applications.

* Globalization of business activities, along with a general increase in pace and competitiveness is demanding that the information systems function be more responsive and flexible in the provision of adaptable solutions.

INPUT believes that all of that the combined effect of these factors is likely to have a profound change on IS management in the 1990s. To examine that effect number of different kinds of research techniques were employed.

A
Sources of Information

Exhibit II-1 lists the four primary sources of information utilized in preparing the analysis and conclusions set forth in this report. Some background on each will provide the reader with some insight into the variety of perspectives utilized in formulating the conclusions.

* *INPUT/Andersen Consulting CIO Study* - Conducted jointly by Andersen Consulting and INPUT, this study consisted of 30 indepth interviews with leading CIOs, and three additional interviews with industry experts.

* *INPUT Annual User Survey* - Designed to gain insight into budgets, organization, trends, key technologies and future directions, this survey samples about 250 IS executives.

* *INPUT/POSP End User Computing Survey* - This study was conducted jointly by INPUT and the End User Computing Division of the Profit Oriented Systems organization and focused on developments in technology and futures in the role of end users in the information systems management process.

* *Custom "IS Assessment Studies"* - As part of its custom research and consulting services, INPUT participates in engagements which analyze the role of the information systems activity in specific organizations. While the specific information gathered in these assessments is proprietary, INPUT's accumulated knowledge from these engagements has provided significant insight useful in the preparation of this report.

Exhibit II-1

Use JJ89-RDW-3

Although all four sources were tapped in the preparation of the report, the primary insights into the likely future direction of IS management came from the indepth interviews with leading CIOs. Although non-quantitative in nature, they provided many insights into the key issues which will affect the 1990s.

B
Organization

The analysis focused on four key areas:

* *The Role of the CIO* - This part of the analysis focused on establishing a baseline definition for the role and responsibilities of the information systems executive in today's environment. The task proved both necessary and difficult: necessary, in order to have a baseline from which to project the future; difficult, in that it became quickly apparent that the nature of the role varied significantly between industry groupings.

* *Industry Differentiation* - Once the investigation had identified that the role and responsibilities of IS were highly dependent upon industry and the nature of the products, analysis was focused on identifying and understanding the factors that caused these differences.

* *Business and Technology Trends* - Utilizing the survey information from all four sources, plus INPUT's general information on business and technology trends, an assessment was made of which business and technology forces were most likely to have a significant impact on the role of IS in the future.

* *Forecasting the Future* - Finally, the results of the first three phases were used to develop a scenario of the future. Emphasis was placed on what the role of the CIO, organizational responsibilities and structures, and the potential development, network and applications environments of the next decade.

The remainder of the Executive Summary describes how each of these sections of the analysis developed, and presents the most significant conclusions.

C
Role of the CIO

Data for this phase of the analysis was drawn primarily from the *INPUT/Andersen Consulting CIO Study* which addressed such issues as current responsibilities and organization, critical success factors, qualifications for the job and how performance was measured. While there was very little consistency within the group on direct operating responsibilities or organizational structure, there were high levels of agreement on in areas such as objectives, qualifications, critical success factors, and performance measurement. The next few sections give INPUT's interpretation of how today's CIOs view those areas.

1. The CIO's Objectives

While expressed in a variety of ways by respondents, there was a common theme to what today's CIOs perceive to be their primary objective... *"to integrate business and technology; to serve as an educator and communicator, while driving the IS function to support business rather than technical goals"*. The emphasis is on directing or driving rather than managing the function; and the focus is on its integration within the business.

2. Qualifications

Based on the responses of interviewees, the qualifications for the job differ little from those that CEOs expect of other senior executives with some exceptions which reflect, in INPUT's view, the relatively recent transition of the role from one of responsive staff support to proactive participation in strategy issues. The consensus was, that in order to hold the job, an individual needed to have a:

* Business orientation,
* Managerial perspective,
* Intuitive grasp of business/technology relationships,

Supported by excellent people and communications skills.

INPUT believes that despite the emphasis on "understanding the business", a solid intuitive feel for the practical aspects of technology, and its potential application, is critical. Although not explicitly stated as a requirement by many of the interviewees, the requirement was implied by at least 70% of the respondents.
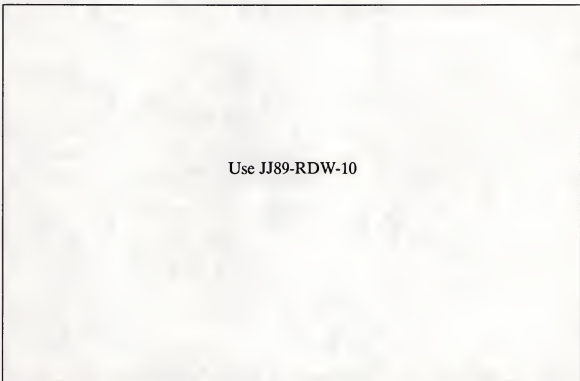
3. Critical Success Factors/Measurement Criteria

Most of the executives surveyed ranked "support from top management" as the primary key to success. Meeting the qualifications and establishing credibility with peers ranked about equally, and were clearly rated more highly than any of the other factors cited by survey participants.

As might be expected, the measurement criteria for CIOs are primarily subjective and appear to be comparable to those of other senior executives. Surprises seem to be the one area where the CIO is perhaps at greater risk than his peers. And as indicated in Exhibit II-2, most are measured by some sort of "hard" criteria on three of the four primary responsibility areas of enterprise planning, technology strategy, systems development and systems operations.

Exhibit II-2

Use JJ89-RDW-10

It was in analyzing the roles and responsibilities of the CIO in these four areas that it became apparent that there were significant variations which appeared to be a function of industry.

D
Industry Differentation

The survey data indicates that IS responsibilities are generally broken down into five functional areas which are either centralized, decentralized or shared between the corporate information systems organization and operating units. The five areas consist of the four listed under "role fullfillment" in Exhibit II-2, and the fifth IS Policy Management. An indepth analysis of the data indicates that with the exception of IS Policy Management, these responsibilities are divided between the corporate and operating units primarily as function of the basic type of product or service offered by the corporation in question.

* Over **40%** of the CIOs sampled participate directly on a corporate or executive committee level that has responsibility for enterprise planning. And even those that did not participate as full-time members of these management forums, had some sort of formal responsibility to elevate technology issues at that level.

* Over 90% were specifically charted with formulating policy in the area of information systems. In more decentralized organizations, the authority to create policy tended to be tempered by divisional approval processes.

To some degree for enterprise planning, and certainly for technology strategy, systems development and operations the analysis indicates that the actual division of responsibilities between the corporate and divisional organizations is a function of the following three product categories.

* **Information Oriented:** No physical object is actually produced, delivered, modified or maintained.

* **Service Oriented:** The product generally involves the manipulation of some physical object, although the object is of secondary importance.

* **Product Oriented:** Physical objects are the primary output. There may or may not be a service component of some degree associated with the product.

This concept was certified by grouping survey responses according to the scheme depicted in Exhibit II-3 and correlating responses for the interviewees for each responsibility area.

Exhibit II-3
Industry Grouping by Product Category

PRODUCT ORIENTATION	INDUSTRY
Information Oriented	Banking and Finance Insurance Telecommunications
Service Oriented	Retail/Wholesale Transportation Utilities Medical
Product Oriented	Discrete Manufacturing Process Manufacturing

Exhibit II-4 summarizes the results of this correlation process. It shows, for example, that for companies who deal in information based products that the information systems function is likely to play a very strong role in all four major responsibility areas; and furthermore, the actual execution of those responsibilities is likely to be highly centralized, with the possible exception of systems development.

At the other extreme, the matrix would indicate that in companies whose primary product is a physical object, IS is likely to play a strong role in technology strategy, with modest participation in enterprise planning and systems development. But, actual execution of these responsibilities tends to be mixed between the central and divisional IS functions.

Exhibit II-4

Use JJ89-RDW-15

Although it is clear that other factors such as corporate culture, product technology, and general organizational philosophy have a bearing on the strength of the IS function and the distribution of IS responsibilities, INPUT believes that this correlation between the nature of the product and the role and organization of IS is dominant. Furthermore, INPUT believes that as information technology becomes even more imbedded in the actual operations and product strategy, the correlation will grow stronger. Chapter IV develops this concept in greater depth.

E
Business & Technology Trends

In this portion of the study, the results of the CIO survey were combined with those from the other sources mentioned in Section A to obtain a broader statistical basis for interpreting results.

1. Business Trends

All the available survey information points to four primary trends that will drive the role, organization and mission of the IS function within the next decade. They are:

* *Globalization* - This trend appears to impact everyone. Adding complexity to even the simplest of application system, globalization will also require more sophisticated planning for networks and data architectures.

* **Specialization** - Specialization in products and services, as well as in markets also seem to be a key trend for the 1990s. Business are becoming less monolithic, seeking specific market niches with highly specialized products and services. The demand for information to support these specialized products, as well as track markets and competition will undoubtedly require more sophisticated information systems.

* **Integration** - Integration of business activities is increasing both horizontally and vertically both on an inter and intra-company basis. Developing and implementing architectures which can deal with these sometimes permanent and sometimes transient relationships will become a key issue by the early part of the next decade.

* **Pace of Change** - Shorter life cycles for products, organizations and technologies will create a demand for responsiveness on the part of IS that is unprecedented.

As was the case in analyzing IS responsibilities, the impact of these four major business trends appears to vary in accordance with the nature of the orientation of the product or service being delivered. Exhibit II-5 gives INPUT's analysis of how each of these trends is likely to impact the three industry classifications.

Exhibit II-5
Impact of Business Trends on IS
As a Function of Product Orientation

TREND	PRODUCT ORIENTATION		
	INFO.	SERVICE	PRODUCT
Globalization	High	Medium	High
Specialization	Low	Medium	High
Integration	Medium	Medium	High
Pace of Change	High	Medium	High

■ = High Impact   ▨ = Medium Impact   ▒ = Low Impact

2. Technology Trends

a. General Conclusions

The study identified a wide variety of technologies as having potential application in nearly all industries. However, **90%** shared the view that technology itself would not be the dominant influence for change in the IS function. The four most prevalent views were that technology:

* Was primarily an *enabling* not a driving force.

* Tends to be evolutionary rather than evolutionary, allowing for better forecasting and long range planning.

* Is seldom a stumbling block to accomplishing most objectives; i.e. with limited exceptions, there is a good was to do it, if you can really identify what needs to be done.

* Is more predictable than the business situation, and is therefore more easily balanced in than other factors impacting successful applications.

Despite the fact that these views tend to play down the importance of technology as a driver in the next decade, it was clear from analysis of the interview sample that everyone agreed that key technology decisions had long term impacts. This is particularly true in the area of technology architecture.

Furthermore, the CIOs sampled felt that the justification for the introduction of new technology was rapidly shifting from pure cost benefits to one of providing or defending business opportunities. Justification increasingly is weighed on whether the introduction of the technology will provide:

* Comparative advantage - Get us ahead.

* Comparative equity - Get us even.

* Comparative necessity - Keep us from going out of business.

b. Thoughts On Specific Technologies

In terms of todays technologies or technology strategies which will have the greatest impact on the first half of the next decade, the responds were pretty consistent. Exhibit II-6 presents the results of ranking the respondents views of the importance of these existing technology concepts.

Exhibit II-6
Ranking of Key Technology Trends

1.	Integrated Data Bases (Relational)
2.	Platform Independence/Systems Connectivity
3.	CASE Technologies
4.	Expert Systems
5.	On-Line Transaction Processing Capabilities

It should be noted, that a large number of the respondents have been disappointed in their experiences with CASE to date. Since the sample consisted of leading edge companies, many have already made significant investments in CASE strategies, and few could site benefits. Most feel that it will be the middle of the coming decade before any significant tangible progress will be made in revolutionizing the development and maintenance of applications systems.

The respondents were also asked to rank *emerging* technologies with regard to their impact. Exhibit II-7 gives that ranking.

Exhibit II-7
Ranking of Impact of New Technologies

1.	Image Processing
2.	Voice Recognition
3.	Natural Language Processing
4.	Self-Teaching Expert Systems

In the case of these emerging technologies there was a big gap between the first two and the last two on the list. Most respondents felt that image processing and voice recognition had a lot more potential in the immediate future than either natural language processing or self-teaching expert systems.

Based on INPUT's analysis of the responses to the survey, the highest impact technologies will most likely be those involving the management of data, and those which move toward platform independence. Continued developments in voice and image management and processing will likely provide the greatest opportunities for rethinking entire applications suites in many industries.

F
Forecasting the Future

INPUT believes that the importance of information technology will increase across all industry sectors, and in virtually all aspects of the business over the next decade.

* The increasing integration of information technology into the business infrastructure of corporations will elevate the need for information systems functional expertise at both the senior management and operating unit levels.

* The objectives and problems of the senior executive in information systems will be similar to those of today, comparable to those that other senior executives face; and heightened in complexity large as a result of business and not technological issues.

* Increasing levels of integration, extended use of communications systems and emphasis on business planning will all have a significant impact on the role of IS.

Exhibit II-8 summarizes these impacts.

Exhibit II-8
Key Future Trends - Impacts on IS

TREND	IMPACT ON IS
Business Integration - Within Companies Business Integration - Between Companies Decentralization of Technology	Centralization of Infrastructure Planning
Increasing Use of Communications	Network View of the Corporation
Emphasis on Business Planning	Decreased Involvement In Operations

1. Organizational Structures

Despite the fact that management responsibility for specific aspects of the information systems of a business will vary by industry, INPUT believes the general trend in the next decade will be to move toward a split in responsibilities between central IS and business units analogous to the division of responsibilities between the federal and state governments of the United States. Exhibit II-9 shows how a split of these responsibilities might be constructed; where corporate IS could be viewed as playing the federal role, and unit IS, the role of the state government.

Exhibit II-9

Use JJ89-RDW-25

* Corporate IS will assume a more powerful role in policy and standards, enterprise planning, strategic partnering and technology. More likely than not, the corporate function will actually execute in the area of systems development and network operations for only those systems and services which serve the general interests of multiple business units.

* Unit or division IS is likely to pick up more of the hands on aspects of dealing with information systems. Operating within the context of corporate standards and architectural guidelines, unit IS will develop those system to support their specific business needs.

2. Network Environments in the 1990s

The fundamental transformation in the importance of networks is already underway, and will continue into the 1990s.

* The trend away from application "captive" or single function networks will continue to accelerate, with most companies increasingly moving toward an architecture where a single network will serve as a high function capability serving all classes of applications.

* The view of the network will turn inside out, with the workstation being viewed as window into a general reservoir of applications and data to be used for almost any class of application.

* Networks will deliver new forms of digitized information, namely image and voice.

3. Development Environments

Just as the development of the network infrastructure will become a key thrust of the 1990s, so will the adoption of new techniques for the development, maintenance and management of applications.

* CASE will become a reality.

* The trend toward platform independence and object oriented systems definitions will increase the efficiency with which applications can be conceived, designed and prototyped.

* Systems development (at some level) will be performed by a large number of organizations within the context of well defined architectural standards.

4. Other Projections

Finally, INPUT believes that the growing information services market will provide opportunities for the 1990s which will impact how solutions are acquired and put into place. Major offerings in the area of systems integration and operations are already having an impact on how client organizations do and manage implementations. These trends are likely to continue through the 1990s.

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III
The Role of the CIO

To understand how the IS function is likely to evolve over the next 10 years, it is necessary to establish some baseline definition of what the "typical" IS function is and does today. Obviously, to obtain a homogenized definition of a function as diverse as information systems is difficult for at least two reasons:

* The wide degree of variation in the role and responsibilities that the survey identified between different industry groups;

* The state of evolution of the function within particular companies and the significant variations in particular organizational cultures

The approach taken in this study was to define the baseline role of IS in terms of examining the roles and objectives of the CIOs participating in the study, as well as their views on the qualifications for the job, critical success factors and performance measurement. The remainder of this chapter discusses these items and develops a working model of IS which will be used to examine how likely developments in business and technology will impact the role of IS in coming years.

A
Background

Before beginning the detailed analysis of the information obtained through this study, it is useful to examine how the role of IS and its top executive has evolved over the past two and a half decades.

It is clear that as a result of developments in technology and evolving business requirements, the role of the top IS executive in most U.S. corporations has grown from managing back office operations to participating in the integration of technology into corporate strategy. This evolution can be characterized along a number of dimensions. Two which seem to depict this significant change in role over the past twenty-five years are the span or organizational breadth of the application, and the complexity of the required solutions. Exhibits III-1 and III-2 depict the development of the IS function along these dimensions.

1. Breadth of Application (Exhibit III-1)

As depicted in the exhibit, the organizational breadth of the application of systems technology has grown significantly in the past two decades. Early applications were largely focused on automating existing individual accounting and back office processes. Decision making was contained within an individual department or organizational unit. As systems supporting these individual processes became integrated, they began to encompass the operational aspects of entire departments.

Exhibit III-1
Breadth of Application

Use JJ88-DT1-4

The evolution has continued for most firms in recent years to the development of integrated systems that span entire business divisions; some directly interfacing with customers and suppliers. As these types of systems have grown in scope, the processes of managing their development, implementation and modification have required increasingly sophisticated management controls and inter-organizational coordination lead by the IS executive.

Today, more than half of the IS executives surveyed in this study find themselves required to manage even more complex inter-organizational processes as they attempt to implement strategic systems that operate on an inter-company basis. INPUT believes that this trend toward the integration of systems across diverse organizational structures, both internally and externally, will be a dominant theme of the next decade.

2. Complexity of the Requirements (Exhibit III-2)

Evolving in parallel has been the growing complexity of the applications themselves. Early systems relied heavily on batch processing of standalone systems. Interfaces with users were buffered by individuals familiar with the technology. Improved computer performance and the availability of new technologies has driven the development of interactive processing as well as the integration of distributed systems. As a result, complexity has continued to grow; necessitating:

Breadth of the Relationship

Inter-Business Proc.
Business Operations
Business Processes
Departmental Operations
Departmental Processes

Breadth ↑

1970   1980   1990   2000

define difference between process + operations

INPUT

NOTES:

JJ88-DT1-4

INPUT
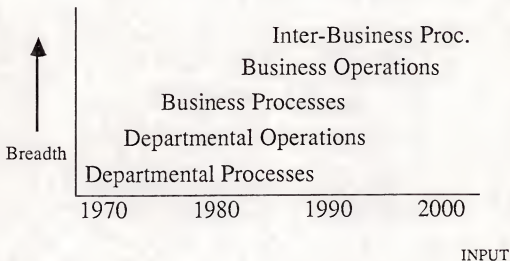
* Sophisticated back-up and recovery systems.

* Increased cross-functional user involvement in the design, operation and evolution of systems.

* More rapid response to changing business situations.

Exhibit III-2
Complexity of the Requirements

Use JJ88-DT1-5

It is not surprising, that over this period of time, the information systems function and the stature of its top executive have grown significantly. In many major industries the deployment of information technology is so imbedded in the business process itself that the business would cease to function if the capability were withdrawn.

Even the title associated with the job has evolved to reflect the changing impact of the function; from Manager of Data Processing, to Dirctor of MIS, VP of Information Systems, and today to Chief Information Officer.

With this background in mind, let's examine how some of the leading IS executives who participated in the study would define the role.

Complexity of the Requirement

Complexity (vertical axis arrow)

Strategic Info Systems
Mission-Critical Systems
Distributed Processing
Interactive Systems
Applications
Data Processing Sys.

1970   1980   1990   2000
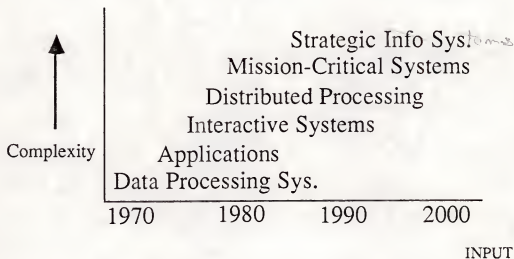
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NOTES:

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INPUT

B
The Role of a CIO

It should be pointed out that INPUT contacted over 55 senior information systems executives in the process of obtaining the 33 indepth interviews used in this analysis. Only <u>one</u> of the 55 actually carried the title of CIO, despite a whole magazine named *CIO* and common usage of the acronym in the industry press. Several of the survey respondents, in fact, had objections to the use of the title. The most common were:

* There is no standard or accepted definition of what it means.

* It sounds too narrow and functionally focussed, and implies a lack of company-wide perspective.

* Or to quote one of the respondents... *"no one calls themselves 'Chief Marketing Officer' or Chief Manufacturing Officer' "*.

On the other hand, the title, Chief Financial Officer (CFO), appears to be quite common in corporate America; and some strong analogies can be made between the role that the CFO plays and that of the IS executive. Yet INPUT believes that there are some subtle differences that are likely to become more pronounced in the future. We'll re-examine the point again at the end of this chapter.

1. Objectives

Despite the aforementioned difficulty in coming to a commonly accepted definition for the title CIO, substantial progress can be made by breaking the problem into two parts.

* Examining the objectives of the position. (Why was the position created and what is the position supposed to accomplish?)

* Determining, if possible, the role and common set of responsibilities assigned to the position in order to accomplish the objectives.

On the first point, survey respondents had almost a universal or common view which INPUT believes can be stated in the following working definition of a CIO's objectives.

> *"...to integrate business and technology; to serve as an educator and communicator, while driving the IS function to support business rather than technical goals"*

Analysis of the survey results indicates that this statement of core objectives is viewed as valid by virtually all respondents. Furthermore, the objective statement seems to apply across all industries no matter how individual roles and responsibilities are structured.

Some additional thoughts on this working definition of a CIO's objectives:

* The emphasis is on directing/driving the IS function, rather than performing or managing. At least five survey respondents had the objective described above but had little or no responsibility for managing organizations which could accomplish implementation or carry on operations.

* The focus on information systems is secondary to the business focus.

* To accomplish the objective, the role, no matter how it is structured, is proactive. The key words are *integrate, educate, and communicate*.

This last point, while somewhat subtle, may be the single factor that differentiates the CIO from previous incarnations of the IS executive. It has only been in recent years that any significant numbers of IS executives have migrated (or been allowed to) from the position of "responding to user needs" (passive) to the more proactive posture of leading the organization in the aggressive use of technology as a part of business strategy. In effect, the survey results strongly indicate that the CIO is more often than not seen as an important corporate change agent by the CEO. The two most cited targets for the change agent activity were:

* Improving the competitive position of the company through better use of information technology.

* Getting the business unit management "involved" in the use of technology to accomplish their own missions.

In summary, there appears to be a great deal of agreement on the objectives to be accomplished by the top executive of information systems, regardless of industry. Of course, establishing the objectives doesn't provide a clue as to *how* they are to be accomplished.

2. Role and Responsibilities

How addresses the role definition; i.e., the determination of organizational structure, responsibilities and the management processes by which the CIO's resources are deployed within an individual company. The survey results clearly indicate that there is little commonality in this role definition across all industry groups. However, retabulation of the data indicates that there is a great deal of commonality in role definition between organizations which have similar product/service orientations. This concept will be discussed in greater depth in Chapters IV and V.
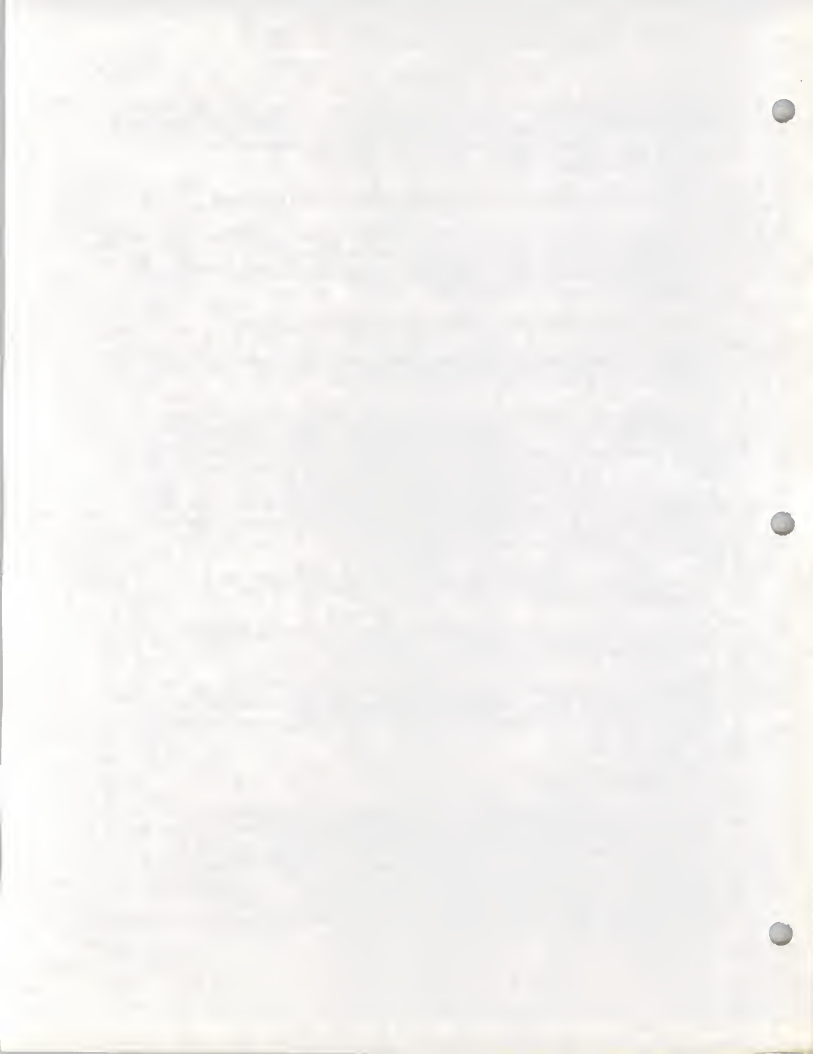
C
Qualifications and Critical Success Factors

Two other sources of information which provide insight into the role of the CIO are:

* An analysis of the kinds of qualifications that are required for individuals that hold the position.

* A composite view of the critical success factors which condition the environment for achieving the objectives.

Several questions asked during the IS executive interviews were designed to gain information in these areas. In particular, questions D5 and D6 (See Appendix B) spoke to these points. In addition to the views of the IS executives themselves, INPUT interviewed an executive recruiter, Skip Tolette of Johnson Smith & Knisely, who specializes in recruiting top IS executives and Dr. F. Warren McFarlan of the Harvard Business School on these subjects.

The survey responses clearly support the idea presented earlier (Section B-1) that a proactive posture coupled with a strong leadership position is critical to meeting the objectives.

1. Qualifications of the CIO

Regardless of industry the survey results indicate a high degree of consistency on the kinds of qualifications that are required to successfully fill the CIO position. Exhibit III-3 summarizes the key qualifications.

Exhibit III-3
Qualifications of a CIO

- Business Orientation

- Managerial Perspective

- Intuitive Grasp of Technology/Business Relationships

- Communications Skills

- People Skills

Since the questions regarding qualifications were open-ended, it is not possible to give a ranking. However, it is clear from analysis of the data that the first three on the list were mentioned directly or implied by over 80% of the respondents. Examining the top three in more depth:

* **Business Orientation** - In order to play on the executive team and provide the leadership role, an understanding of the business, its economics, customers and fundamental structure is essential and must "dominate", at least in the eyes of the other executives, the technology orientation. To quote one respondent, *"The job is not to optimize technology, but to optimize the business <u>through the use</u> of technology."*.

* **Managerial Perspective** - The majority of respondents interpret managerial perspective in this context to mean the prioritizing, decision making skills, and ability to assess business risk, that has come to be associated with intuitive executive judgement. Several respondents commented specifically that others on the management team looked to them as the "integrator" of the information factors into the general management decision making process.

* **Business/Technology Relationships** - The ability to relate technology to business issues in a way that can be communicated is not commonplace. Furthermore, it is clear that without this skill, the CIO is not likely to be able to accomplish the kind of mission defined earlier in this chapter. So what does a CIO need to know about technology in order to be successful?

INPUT believes that the survey responses underplay the level of technological depth required for success as a CIO. Perhaps this is a result of managerial orientation of the survey; or represents a bias in the sample which mainly consists of IS executives who have achieved successful integration into the executive management levels of their firms. At a minimum the CIO must have a firm grasp of the practical aspects of the major existing and emerging technologies that create opportunities for strategic initiatives. They must maintain adequate technological competence to:

- Make the judgements necessary to direct increasingly specialized and limited staff resources in the exploration of new technologies that could be applied to yield competitive advantage.

- Evaluate the technology strategies of competitors.

- Apply sound business judgement to technology recommendations of subordinates.

- Interpret and communicate the business impacts of technological developments and his own strategy recommendations to his executive peer group.

A final thought on the subject of technological competence... Section B1 of the survey solicted the respondents' thinking on the evolution of information technology. Based on the level of sophistication of the responses, it is apparent that the group commands considerable technical depth. Much like the CFO, technical knowledge may not be at the top of the list of qualifications, yet it's understood or assumed that the knowledge is there.

2. Critical Success Factors for the CIO

The CIOs surveyed cited the factors listed in Exhibit III-4 as primary to being successful.

Exhibit III-4
Critical Success Factors for the CIO

- Support from Top Management
- Meeting the Qualifications
- Credibility with Peers

In terms of ranking the factors, *support from top management* was clearly number one on the list. A number of the successful survey respondents commented that they had worked in environments where this component was missing, and the results were at best marginal. INPUT's analysis of the data indicates that support from the top is most likely when one or both of the following situations exists:

* The corporate culture is attuned to information technology (IT). That is, there is no problem with a justification of the role. (This situation occurs most frequently in industries whose products or services are information oriented; such as banking and finance or insurance.)

* The top management (CEO) understands that a cultural change is needed and perceives information technology as part of the program to effect the necessary changes.

Meeting the job qualifications ranked a close second in the list. It is interesting to note, that the qualifications are the ones discussed in the preceding section. A number of CIOs commented on the fact that these weren't necessarily the qualifications that the hiring company or CEO perceived as being critical. At least three respondents commented that CEOs frequently place a lot of emphasis on technical qualifications, even though in the end, it is likely that technical excellence will have, as one IS executive put it, *"little to do with how performance is measured"*.

Virtually all survey participants felt that *credibility with peers* was a significant component of achieving success. There were a variety of thoughts expressed regarding how this credibility can be developed, and how it is assessed by the peer group. Some of their thoughts are summarized below.

* The consensus seemed to be that credibility is based on belief that the CIO shares common experiences and objectives with the peer group. Sharing the same problems, and having objectives which place the CIO in the light of supporting, rather than competing with, the peer group are good examples.

* Many of the CIOs surveyed felt that holding the position without having line responsibility for delivering some significant component of the results worked against credibility. Direct management responsibility for systems development or ongoing systems operations was perceived as a plus in terms of being credible. One executive commented that, *"... it implies that the CIO is measured by the same hard criteria as peers in the Business Units."*

* Another factor cited by several executives as key to achieving credibility was perceived objectivity and fairness in management of the planning process, prioritization of projects and resource allocation. One executive commented that, *"Since the CIO is supposed to have a corporate role, he should have a corporate agenda. One of the biggest problems a CIO can face is being perceived as parochial, in support of the IS function."*

D
Evaluation of the CIO

The preceding discussion summarized the survey findings on qualifications for CIOs today and the critical success factors for the position. A third part of the survey addressed itself to how CIOs are measured and evaluated. The message that came out loud and clear was... *NO SURPRISES!*. The consensus of the respondents was that no matter who has line responsibility for an area, if there is an IS-related problem, the CIO will be held accountable for failure to spot it, influence/change or solve it, or blow the whistle in time. Some other observations that seemed to apply across most of the sample:

* Very few had formal job descriptions. Although the survey did not address itself to this question explicitly, at least one-half of the respondents mentioned the fact they did not have one.

* Most felt that the CEO/COO's perception of how well the individual met the broad objectives (generally of the type described in Section A) was the primary measurement criteria, even in situations where other more specific objectives were in place.

* Approximately 40% indicated, that to some degree peers, formally participated in their evaluation process. Even in situations where there was no formal participation by peers many respondents indicated that reputation and credibility with peers was very important in their evaluation.
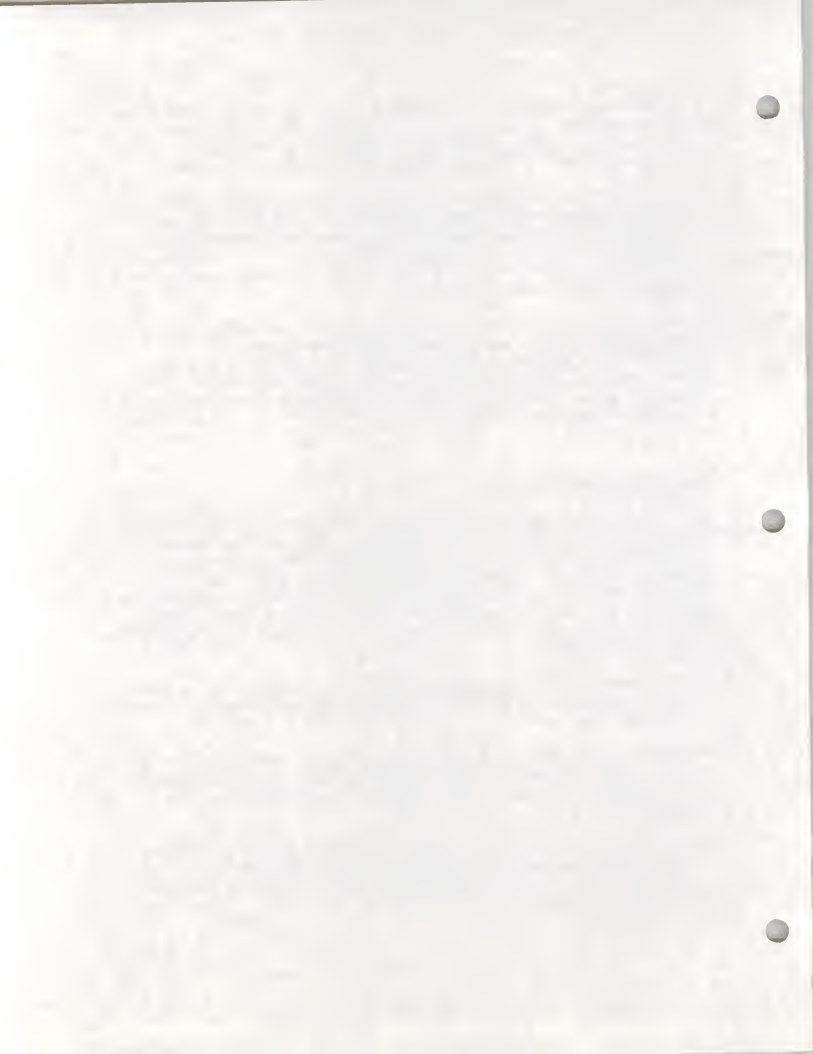
Beyond the high level evaluation of overall objectives, and in addition to the "no disaster" (or what we might call "survival") criteria, most of the CIOs in the survey are measured to some degree or another on four distinct aspects of the job; enterprise planning, technology strategy, systems development, and operations. Obviously, there is considerable variation between individual survey respondents in the weighting of these components. The variation is largely a function of how their individual roles and responsibilities are structured. Disregarding the weighting, there was a lot of consistency in how the survey group felt these job components were measured.

* *Enterprise planning* is strictly a subjective call. Some respondents felt that they scored well in this are by playing a facilitating role, and others by being more proactive.

* In the area of *technology strategy* there appeared to be both hard and soft aspects to the measurement. The actual existence of a written strategy and an evaluation of how well the process for building and maintaining that strategy worked provided the "hard" side of the measurement. How effective the strategy was in supporting the corporation's objectives was much more subjective.

* For both *systems development* and *operations* most executives were evaluated on hard criteria. Meeting development cost/time/performance standards were the prime criteria for systems development. Meeting cost and service level standards dominated the operations component. In many instances there was strong emphasis placed on maximizing system availability as a measurement criteria for operations.

Exhibit III-5 summarizes the performance evaluation criteria for CIOs.

Exhibit III-5
Performance Evaluation Criteria for the CIO

MEASUREMENT	H/S*	COMMENTS
No Surprises	H	Overriding Survival Criteria
Broad Objectives	S	Technology/Business Integration
Role Fullfillment		
Enterprise Planning	S	Participation and/or Leadership
Technology Strategy	H	Plan Exists/Process Works
Technology Strategy	S	Plan Is Effective
Systems Development	H	Cost/Schedule/Performance
Systems Operations	H	Cost/Service Level/Availability

* - **H** = Hard Measurement Criteria, **S** = Soft

E
Summary of Findings

This chapter examined the current state of the IS function through analyzing the objectives, role, qualifications, critical success factors, and measurement criteria for today's CIO. A synopsis of the conclusions follows:

* Most CIOs, regardless of industry, share a common objective... "*...to integrate business and technology; to serve as an educator and communicator, while driving the IS function to support business rather than technical goals*".

* The roles of individual CIOs (organizational and staff responsibilities) vary significantly, but in almost all instances the CIO has some level of responsibility in the following four areas.

  - Enterprise Planning
  - Technology Strategy
  - Systems Development
  - Systems Operations

* The qualifications for the job differ little from those that CEOs expect of other senior executives with some exceptions which reflect, in INPUT's view, the relatively recent transition of the role from one of responsive staff support to proactive participant in strategy issues. Some observations on these exceptions follow.

  - Despite the emphasis on "understanding the business", a solid intuitive feel for the practical aspects of technology, and its potential application is critical, even though underplayed by most successful CIOs.

  - As the "champion" of the role of technology in optimization of the business, CIOs require superior communications skills to both educate and sell to peers, many of whom buy the CIO's recommendations as a matter of faith.

* As is the case with qualifications, the measurement of a CIO's performance does not differ significantly from that of other senior executives. The measurement is primarily subjective, with the requirement that the CIO meet budgetary, schedule and operational schedules for those operational functions directly under his management. Surely this is no different from what would be expected of manufacturing or sales. *Surprises* appear to be the one area where the CIO is perhaps at greater risk than his peers.

The next chapter develops a framework for looking at the organizational responsibilities for information systems and examines how the nature of characteristics of particular industries influence the actual responsibilities of the CIO.

IV
IS Role Structure

As indicated in Chapter III, the survey identified that even though most companies have charged their CIOs with essentially the same objectives, they have developed a wide variety of role structures/organizational approaches to dealing with the actual implementation and ongoing management of information systems. An analysis of the survey responses indicates that:

* The primary division of operating responsibilities is typically split between a corporate IS function and a comparable function in one or more business units.

* There are five primary IS management functions which must be managed, at either the corporate or business unit level.

* The degree of centralization of the management of each of these IS functions is primarily dependent upon the differing information requirements of the host company's industry.

This chapter utilizes the survey data to establish a framework for IS management responsibilities, and presents INPUT's analysis of how management responsibilities are likely to vary as a function of the information requirements of various classes of industries.

A
IS Responsibility Framework

Generally, the survey data indicates that IS responsibilities can be broken down into two levels and five functional areas. The five areas consist of the four that were mentioned in Chapter III, as primary areas of performance measurement for the CIO, and *IS Policy Management*. See Exhibit IV-1.

At a corporate level, the CIO generally dominates the IS policy development and management areas, and shares responsibility the four remaining functional areas with other business unit executives. Where the CIO does not have line responsibility for IS activities in a business unit, there is almost always a matrixed (dotted line) line relationship between the two organizations.
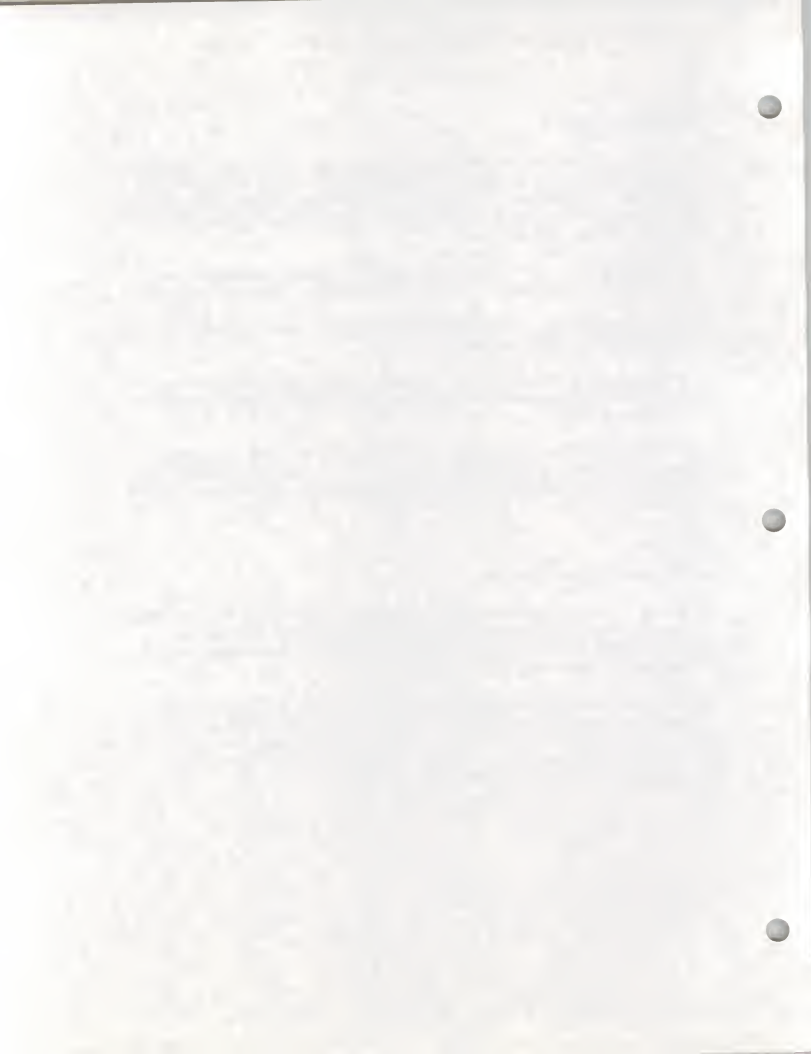
Exhibit IV-1
Primary Areas of IS Responsibility

- IS Policy Management

- Enterprise Planning

- Technology Strategy

- Systems Development

- Operations

Before examining how the nature of the host industry impacts the allocation of
responsibilities between corporate and business unit IS functions, it is worth
spending some time presenting the thoughts of survey respondents on the five major
areas of responsibility.

1. Enterprise Planning

Over **40%** of the CIOs in the survey participate directly on a corporate or executive
managing committee that has enterprise planning responsibility; and, are therefore
afforded the opportunity to participate directly in the long range planning of the
firm. For others, participation at this level in enterprise planning is more passive.
Twenty percent **(20%)** of those who didn't participate directly in such committees
indicated that they formally reviewed policy, strategy and proposed strategic
decisions with regard to technology implications. And, virtually all IS executives in
the survey had access to processes which allowed them to take initiative at a senior
level on strategic issues involving technology.

Virtually all the survey respondents participate to some extent in enterprise
planning at the business unit level. Typically, the role is that of advising or
consulting on the information technology strategies of the business unit, or
reviewing and approving business unit technology initiatives. In some instances, the
CIOs interviewed actually have line responsibility for business units.

2. IS Policy Management

Over **90%** of the IS executives responding to the survey were specifically charged
with formulating policy in the area of information systems. The areas covered
ranged from technology standards (discussed in the next section) to personnel
practice, security and a variety of other subject areas. In more decentralized
organizations, the authority to create policy tended to be tempered by divisional
approval.
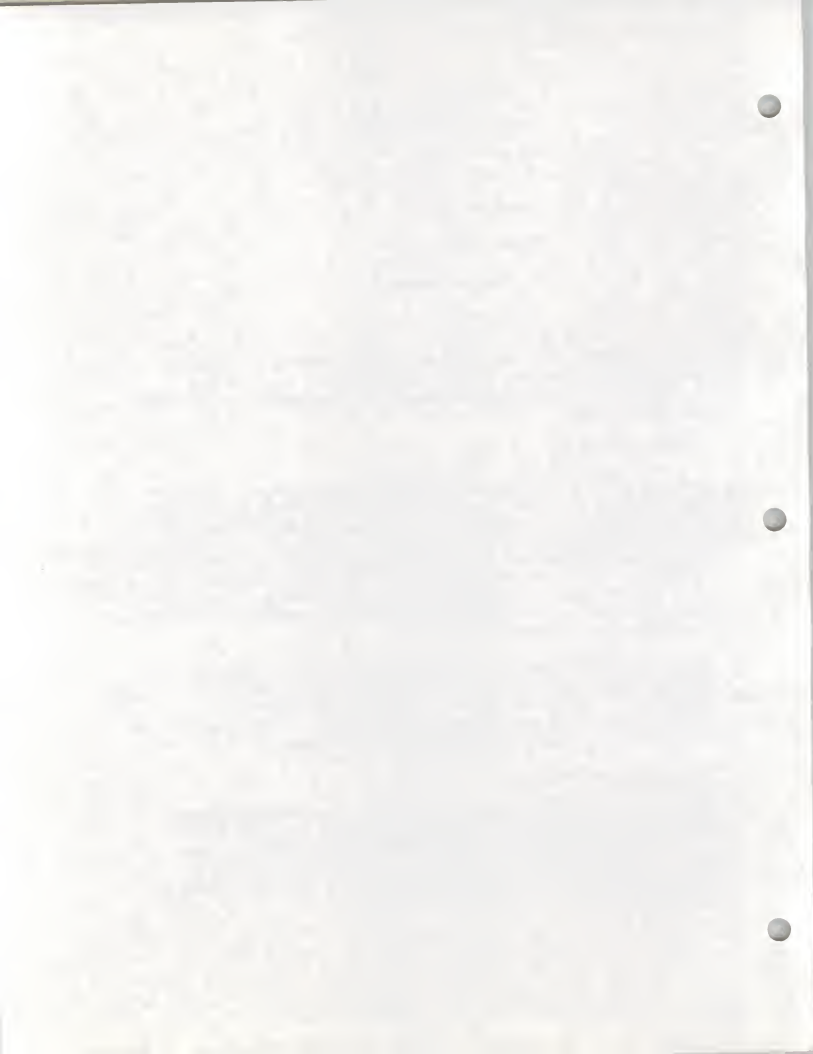
In almost all circumstances the CIO utilized various processes to involve divisional or business unit IS and operating executives in the policy setting and management process. In instances where it made sense to have different policies in different business units, the CIO was invariably involved in the approval process.

Although many respondents discussed vendor control and relationships as a component of technology strategy, INPUT believes that the subject should probably be considered as a component of *IS Policy Management*. In this area the corporate function generally assumed two responsibilities:

* The role of evaluating potential vendors and maintaining "approved" lists for use throughout the corporation.

* Negotiating corporate-wide contracts to provide for volume discounts and service agreements.

Responses in this area indicate that there has been a significant shift in the corporate role with regard to vendors and specific products. The role has shifted away from that of "gatekeeper" to one of assuring that vendors meet broader based functional and business standards; thus permitting users to select from a variety of vendors which meet architectural standards.

3. Technology Strategy

The corporate role in technology strategy, as described by survey respondents, was very consistent across all industry groupings. In addition to managing the process for developing and maintaining a written technology strategy or plan, the corporate IS function took responsibility for information technology R & D activities, architectural standards and the control of the vendor environment.

Central control of the architectural standards was considered key to having an effective technology strategy. There was a high level of agreement on those areas where architectural standards must exist.

* **Database Design & Content** were considered key, especially for corporate or shared data bases. Even in instances where there were few data interfaces between business units, respondents felt that a centralized approach to data architecture and related technologies was essential.

* **Systems Design & Development** technologies, including CASE methodologies, project life cycle standards, coding conventions, etc. were largely considered within the scope of the corporate IS functions.

* **Connectivity/Communications** standards were considered critical to maintaining flexibility and providing effective corporate coordination of disaster/backup processes.

It is not surprising that a number of IS executives cited centralized control of technology strategy and the associated standards as the key component to permitting effective decentralization of many IS functions. One respondent said, *"Architectural standards are the key to decentralization... setting and enforcing standards enables users to take responsibility for their own IS support by ensuring that all current and potential integration and connectivity issues are resolved in advance."*.

This does not imply that there is no role for technology strategy at the business unit level. Business units generally set their own technology strategy within the boundaries of corporate standards and strategy. The focus is more frequently on applications architecture, and the role of the corporate IS function is to provide:

* Consultation on application of the technology in conjunction with business unit operational management. *(What should be done.)*

* Lower level direction and technical support to business unit systems staffs on implementation. *(How to do it.)*

4. Systems Development

As might be expected, this area exhibited the greatest variety of responsibility arrangements. In general however, the corporate IS function of the companies surveyed assumed responsibility for "core" or infrastructure systems, including those that operated off of shared data bases or provided processing services to multiple business units. Typical examples would be:

* Check processing for all areas of a bank.

* Personnel/payroll across all business units.

* Budgeting, financial reporting and consolidation systems.

* Electronic mail utilities.

The main factor in determining the extent of development activity at the corporate level is clearly the size/extent of core systems as a function of both industry and organizational structure. The stronger the functional control at the top (Finance, Human Resources, Materials Management, etc.), the greater the tendency to utilize common systems across various operating units.

The trend is clearly to push systems development into the business units for applications that are specific to their business needs. Generally, this would include the analysis, design, implementation and maintenance of business unit applications portfolios. However, in many instances, the corporate organization maintains significant involvement in one or more aspects the applications development and maintenance process, particularly where centralized data bases are involved.
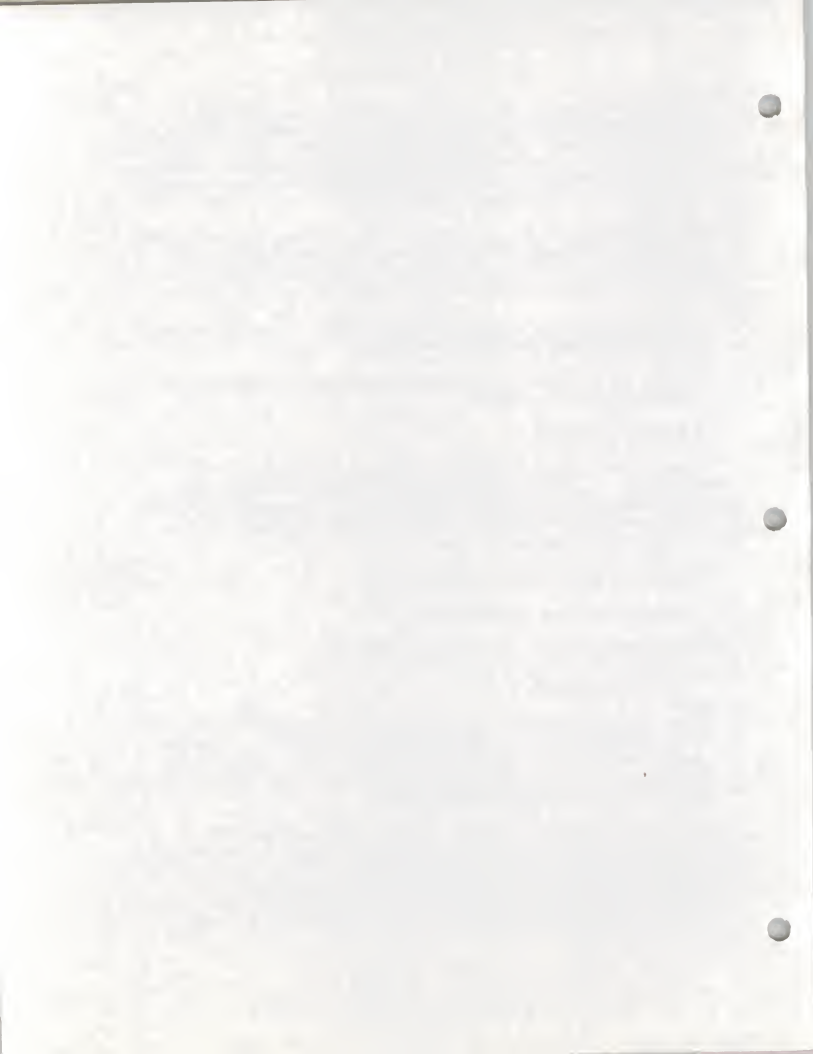
5. Operations

The survey data indicates that responsibilities in the operations area do not vary nearly as much by industry or company organizational structure as do those for systems development.

In general, if there are "core" applications, there is a corporate data center and associated network managed by the CIO. Frequently the CIO will manage "utility" data centers as well to provide bulk processing services to business units or corporate functions in situations where establishing individual processing facilities would work against the general economies of scale that can be achieved by larger data centers. The CIO may also manage some "back office" clerical functions that are dependent upon core systems in situations where the functions serve multiple business units.

In almost all companies surveyed, individual business units to some degree had their own dedicated data centers to handle divisional systems. Some even have proprietary telecommunications networks, and in fact operate these independently from the corporate IS function. And, with the exception noted above, almost all business units hold responsibility for their own back office operations.

B
General Model of IS Responsibilities

Exhibit IV-2 summarizes the analysis of primary IS responsibilities discussed in the preceding section. The first column lists the five primary responsibility areas. Columns two and three briefly describe how specific activities are typically divided between the corporate and business unit organizations respectively.

The last column gives a subjective impression of to what degree the split between corporate and business unit responsibilities varies, depending upon the nature of the industry, or an individual companies' organizational cultures. (The darker the shading, the less variation in the assignment of responsibilities.)

(See Exhibit IV-2, Following This Page, Landscape Format)

C
The Impact of Industry Focus

The generalized model for IS responsibilities (Exhibit IV-2) shows that the highest degree of variation in role structures for IS is in the Systems Development and Operations area. As suggested in both this and the previous chapter, this variation in role appears to be driven by the operational characteristic of the industry.
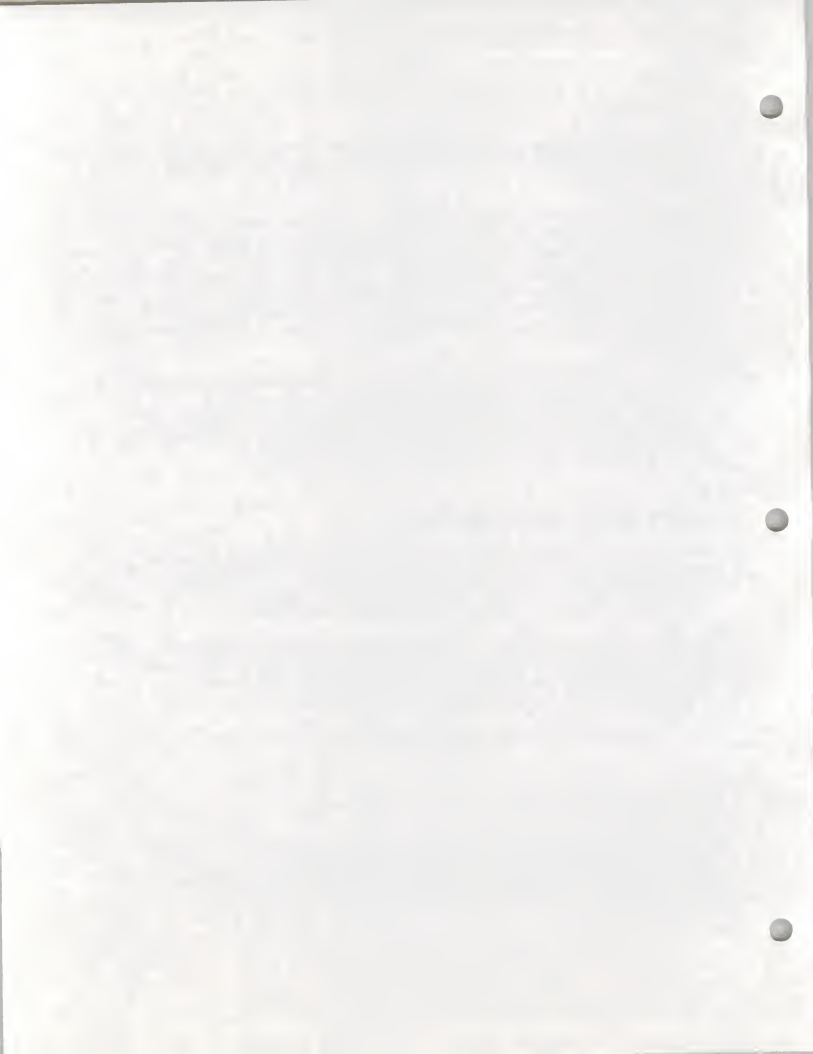
Exhibit IV-2
General Model of IS Responsibilities

RESPONSIBILITY AREA	CORPORATE LEVEL	BUSINESS UNIT LEVEL	VAR*
Enterprise Planning Corporate Role Business Unit Role[1]	Formulate/Execute - - -	Consult/Support Formulate/Execute	▉ ▉
IS Policy Management General IS Policy Vendor Policy	Develop/Enforce Evaluate/Select	Participate/Enforce Contribute/Review	▉ ▉
Technology Strategy Research & Development Architectural Standards - Data Base - Systems Development - Connectivity	Direct Management Develop Corporate Frame- work in All Areas	Participate/Contribute Develop Divisional Appli- cations Architecture Within Corporate Frame- work	▉
Systems Development Standards/Practice Applications Utilities	Develop/Enforce "Core" Systems/Databases Develop/Select - Maintain	Participate/Utilize BU Systems/Databases Utilize	▉ ▒▒
Operations Data Centers Telecom Networks "Back Office"	Corporate and Utility Corporate Data and Voice Shared Function	Divisional/Departmental Divisional Data Business Unit Processing	▒▒ ▒▒ ▒▒

* VAR = Level of consistency in the assignment of responsibilities across all industries.
▉ = High, ▒▒ = Medium, ░░ = Low

1 In addition to corporate-wide responsibilities for planning and management, the CIO may also have line responsibility for one or more business units.

To gain a greater understanding of those characteristics which seemed to have the highest impact on the role and organization of IS, INPUT asked interview participants a series of questions relating to the operational and organizational characteristics of their firms. Appendix C summarizes the areas of inquiry and was used in the interview process to facilitate discussion of the topic.

A comparison of the information gathered on the operational and organizational characteristics of the companies surveyed to the data on the role and organization of their respective systems functions clearly indicates that the *Nature of the Output* is the dominant discriminating variable. Putting it another way, if a company's output predominantly falls into one of three categories listed in the exhibit, it's possible to make a highly accurate prediction of how the role and responsibilities of its systems function are likely to be structured.

To certify this correlation data from the companies in the survey was analyzed by grouping the individual company responses into one of the following three product categories.

* **Information Oriented:** No physical object is actually produced, delivered, modified or maintained.

* **Service Oriented:** The product generally involves the manipulation of some physical object, although the object is of secondary importance.

* **Product Oriented:** Physical objects are the primary output. There may or may not be a service component of some degree associated with the product.

Exhibit IV-3 shows how various industries were grouped to make up the three samples.

Exhibit IV-3
Industry Grouping by Product Category

PRODUCT ORIENTATION	INDUSTRY
Information Oriented	Banking and Finance Insurance Telecommunications
Service Oriented	Retail/Wholesale Transportation Utilities Medical
Product Oriented	Discrete Manufacturing Process Manufacturing

Exhibit IV-4 shows how the the survey sample population is distributed by product orientation.

Exhibit IV-4
Survey Sample Product Orientation

PIE CHART: *(3 Slices)*

(13)	43.3%	Information Oriented
(6)	20.0%	Service Oriented
(11)	36.7%	Product Oriented

Of course there are exceptions to every rule. There are very few major corporations whose output falls purely into the *information, service* or *product* oriented categories.

* Some organizations are actually conglomerates with a mix of operating divisions or business units which produce major offerings in more than one of the categories.

* Some organizations in fact produce a "combined" product. MacDonalds is a good example whose output is a combination of products and services.

But even in cases where the categorization is difficult the predictability is extremely high when the operating divisions of conglomerates are looked upon as individual data points.

D
Product Orientation Impacts on the IS Role

Having regrouped the survey results along the lines discussed in the preceeding section, it is possible to develop a more indepth view of IS's role and responsibilities based on the three product orientation categories.

1. Information Oriented

Information technology (IT) is a key factor in class of firms. In these types of companies "information" is the in fact the product/output and information technology is the basic manufacturing and distribution mechanism. There is often an interrelationship between various individual products and services, and individual products/services may be marketed by multiple business units to different market segments.

The key role of information in these firms means a key role for the information systems functions and the CIO. The CIO is almost always on the executive or managing committee and reports to the top of the organization (CEO, COO, Office the Chairman, etc.). Every respondent in the survey whose organization was classified as *information oriented* played a strong role in enterprise planning, and INPUT knows of no firms of this type where that is not the case.

Core applications which serve multiple business units are commonly developed and managed by the CIO. If these are also managed as separate business units (e.g. funds transfer), the business unit often reports to the CIO. Likewise, most CIOs in this category have a central role in managing operations. In the case of Mellon, First Chicago and Merrill Lynch (all participants in this survey) all IS operations are under the CIO, as well as many "back office" operations.

As is the case with operations, the central IS function takes a very strong position on standards in these types of institutions. As a direct follow on, solid standards enable decentralization of business unit specific applications development responsibilities. This is commonly done in banking, where business units are organized on a product line and/or market segment basis.

* Business units are closer to changing customer and market needs, and therefore can respond more quickly to new product development requirements.

* Individual systems can stand and operate alone, provided they fit into the overall standards.

Two key elements of information oriented firms' strategy are:

* Maintaining flexibility in the systems environment to allow for the rapid creation and modification of products in response to changing market demands.

* Finding new ways to integrate and use information to create new products and service offerings.

This means that a heavy emphasis on standards and technology strategy are key elements in an individual firm's success.

2. Service Oriented

For companies whose product or output is primarily service oriented the importance of information technology is directly related to the information required to provide the service. This is sometimes described as "information intensiveness" and varies significantly between individual companies. It could be viewed as critical in industries such as transportation, and medical, and somewhat more moderate in the retail industry for example.

The survey results indicate that where information is critical, the role of IS and the CIO parallels that of information oriented companies described in Section 1. Some examples of this situation from the survey would include American Airlines, American President Companies, and American Medical Labs. In all of these cases:

* The CIO reports to the CEO, is on the managing committee, and participates heavily in enterprise planning.

* Technology strategy is strong.

* There is centralized management of systems development and IS operations.

* Some core "back office" operations come under the direct management of the CIO.

The survey results indicate that in organizations where information is considered only "moderately critical" to the delivery the services:

* The organization is generally not as sophisticated in the use of information technology.

* The CIO tends to report at a lower level and is involved in enterprise planning on an exception basis.

Even in these firms systems development and operations tend to be centralized, because business units often share core systems and operations, and business units lack the experience to management their own IS activities.

3. Product Oriented

Product oriented firms exhibit the greatest variety of responsibility configurations of the three. These differences are attributable to several factors:

* As with the service companies there are different levels of information intensiveness.

* There are more significant levels of variation in both the products and markets than with information or service oriented businesses.

* There seem to be a greater variety of corporate cultures.

As with service oriented firms, where information is critical, the IS function tends to parallel those in the information oriented industries. A good example is Rockwell. The CIO reports at a high level, but not to the CEO. There are strong technology standards and development responsibilities are split between the central and business unit organizations. As is the case with the companies in the financial services industry, Rockwell has large centralized operations serving multiple divisions with centralized compute power equivalent to thiry-five 3090-200s. Information intensity is the driving force. Requirements include:

*   The need for massive computing power by most business units; e.g. Cray's supercomputers.

*   Significant exchange of technical information between business units.

*   Massive exchanges of technical information between the firm and its customers and suppliers.

At the other extreme are highly decentralized firms in which the CIO or equivalent has essentially no line responsibilities at all. Sun Company and Pepsico are good examples. The function reports at a high level, and participates in enterprise planning, but virtually all systems development and operations are highly decentralized.

Exhibit IV-5 summarizes the likely distribution of responsibilities for the five primary IS functions based on the product orientation and information intensity. The table examines the both the degree of centralization and strength of the function for each product class.

Exhibit IV-5
Distribution of IS Responsibilities
Based on Product Orientation

PRODUCT ORIENTATION	INFO INT.	ENTERPRISE PLANNING	TECHNOLOGY STRATEGY	SYSTEMS DEVELOPMENT	OPERATIONS
Information	H	■ C	■ C	■ M	■ C
Service	H	■ C	■ C	■ M	■ M
Service	L	■ M	▨ M	▨ D	■ C
Product	H	■ M	■ M	■ M	■ C
Product	L	▨ M	▨ M	▨ D	▨ D

▦ = Strong	H = High	C = Centralized
▦ = Average	L = Low	M = Mixed
▦ = Weak		D = Decentralized

E
Other Factors Influencing the IS Role

In addition to the reasonably strong correlation between the nature of a firms primary product and the role/responsibilities of IS, there are a number of other factors that influence both the strength and organization of the IS function.

1. Corporate Culture and Product Technology

For example, corporate culture and the sophistication of production and/or product technology have a big influence on how well a firm uses information technology as a competitive tool.

* Some firms have an aggressive culture and are constantly on the leading edge of systems and technology. These firms view information technology as a strong competitive weapon within their industry and maintain strong IT capabilities. Some good examples include, POS (Point of Sale) in retailing, EDI (Electronic Data Interchange) in retailing/manufacturing, and CAD/CAM/CIM applications in manufacturing.

* Other firms in the same industries which are less aggressive and not on the leading edge are may often be losing potential competitive advantage because of this difference in cultural orientation.

* Where the actual product or manufacturing process utilizes high technology (e.g. the aerospace industry) the use of information technology tends to be leading edge and play a heavy role in enterprise planning.

* Where the technology of the product or its manufacturing process is simple the use of information technology throughout the firm tends to be less sophisticated or extensive.

2. Organizational Structure

The survey responses also indicate that the underlying corporate organizational philosophy has strong influence on how IS responsibilities are allocated. This is particularly true in the area of systems development and operations.

In some industries, organizational patterns are fairly consistent. For example, in the petroleum industry (process manufacturing) the common form of organization is to have independent operating companies reporting into an increasingly lean corporate holding entity. In retailing the typical pattern is to organize store chains into individual business units.

For example *At Sun Co., Inc.* operating companies function as independent entities which have little in common with their fellow corporate subsidiaries, and relatively few linkages to corporate headquarters, including customers, markets, and information processing requirements. Each operating company has a President/COO, its own IS Director, and is generally self-sufficient in IS. The corporate CIO role is in corporate-level strategy and standards, as well as matrixed support and review of the IS functions in each operating company.

At *Carter Hawley Hale* operating divisions are both geographically and market based, and have a great deal in common with their fellow corporate subsidiaries, as well as strong linkages with corporate headquarters for support services such as advertising, marketing and IS. This give the CIO line responsibility for centralized systems and operations.

So, even though the model developed in the preceding section provides a good general framework for predicting the how IS responsibilities are likely to be managed as a function of the nature of the product, it is clear that individual variations in corporate culture, organizational philosophy and general use of technology by the firm can play a significant role in the strength and organizational form of an individual companies IS activity.

V
Business and Technology Trends

Thus far the report has focused on the objectives, role and responsibilities, and factors influencing the organization of the IS function today. This chapter looks at the underlying business and technology trends that are likely to shape the future of the information systems function over the next ten years.

Several sources of information have been used in the preparation of this part of the analysis.

* Sections A and B of the survey addressed themselves directly to business and technology trends. On each point the interviewee was asked to identify the most significant trends in general, and to comment on specific trends that they felt would have high impact on their particular industry.

* Data from INPUT's 1988 annual user survey of over 250 IS executives was also utilized to provide a broader statistical base for assessing key trends.

* Information from INPUT's Vertical Industry Reports, a component of INPUT's Market Analysis Planning Service was used to look at the driving forces of individual industry sectors.

Utilizing this collection of information INPUT has identified the key trends in business and technology that are likely to impact how IS functions and is organized over the next decade.

A
Business Trends

1. Survey Respondents' Views

Analysis of the survey data indicates that the four key trends which will impact IS are:

* Globalization
* Specialization
* Integration
* Pace of Change

a. Globalization

This trend appears to impact everyone. Global sourcing is increasingly important for everything; including, financing, service activities, products and materials. From the point of view of the survey respondents, some subtle changes have been going on in recent years. The traffic has become bi-directional. Many of the firms represented in the survey have been dealing with the competition entering the U.S. markets for years. More recently, however, many U.S. companies have gone on the offensive, developing and implementing strategies for expanding their own markets world-wide. This "outbound" strategy has more significant impact on the role of IS and the complexity of the systems issues than the previous defensive one.

Not one survey respondent felt that this inertia toward globalization would diminish over the next ten years. Barring anything short of a major war, it appears that this trend will continue to have a strong influence on both business and information systems strategies for the foreseeable future.

b. Specialization

Specialization in products and services, as well as in markets also seems to be a current trend. Businesses are becoming less monolithic, seeking specific market niches with highly specialized products and services. The most frequent result is that many firms find themselves breaking up into a larger number of smaller pieces.

A number of respondents speculated that this trend might not represent a long term phenomena. There was certainly a wider variety of opinion on this point than there was on globalization. INPUT believes that whether the trend is long term or not, it will have significant impact on the role of IS over at least the next five years for the majority of firms.

c. Integration

Integration of business activities is increasing both horizontally and vertically. This is occurring on both an inter and intra-company basis. A number of phenomena point in this direction. Almost all respondents cited inter-divisional contracts, consortia, strategic alliances, as well as increasing use of temporary and permanent inter and intra-company projects teams, as a fact of daily existence. Increased use of EDI (Electronic Data Interchange) also points in this direction. Finally, at least five of the interviewees cited integration as the key driver of IS over the next 10 years. The reason? To quote one respondent, *"It provides the greatest opportunity for the strategic systems."*

INPUT believes that this tendency to integration on a variety of levels may be of more significance to the IS function than globalization and specialization for several reasons. It will:

* Require the architectural standards and communications systems be tuned to deal with external transactions and information flows; thus forcing an balanced view between external and internal requirements.

* Provide a large number of opportunities for innovation in the use of technology for competitive advantage. (Along the lines of SABRE and American Hospital Supply.)

* Create opportunities for the application of technology to the development of unique information based products.

d. Pace of Change

Everyone agrees that the pace of change is constantly increasing. Areas where this acceleration of pace was viewed as significant from an IS viewpoint include, technology, deregulation, products/markets, and organizational structures and relationships. The implications for IS are significant. One respondent commented that *"taking a leadership position is the least of my problems... My primary concern is making sure that the kinds of systems I put in place don't inhibit the constantly changing complexion of the business."*.

The survey identified the four trends discussed here as dominant driving forces on the shape of IS in the future. A fifth trend was discussed by at least six of the respondents which is worth mentioning. Although it was expressed in a variety of different ways, the concept centers around the notion that the breadth as well as complexity of an individual company's output (products/services) appears to be becoming more complex.

* Many manufactured products now have increased service and information components.

* Many services are becoming differentiated based on information elements.

Even though this concept was not mentioned as frequently as the other four, INPUT believes that to some degree this trend is a reflection of the "information intensity" issue discussed in the preceding chapter, and is indicative of level to which information and the supporting technologies are becoming increasingly embedded in the heart of most businesses.

2. INPUT's Annual Survey Data

As mentioned in the beginning of the chapter, INPUT's annual user survey also addressed business driving forces and technology trends. To some degree the results are not directly comparable to the responses from this survey for two reasons:

* The questions on business driving forces were constructed differently. This survey was more open-ended than INPUT's annual user survey.

* The population of 250 companies utilized in INPUT's annual survey represents a broader cut in both size of firm and level of IS development than the population surveyed for this study.

Nevertheless, the results strongly support this survey's findings. Exhibit V-1 shows in ranked order the driving forces that the INPUT's annual user survey respondents felt would have the most significant impact on IS over the next five years.

<div align="center">

Exhibit V-1
Information Systems Driving Forces
INPUT's Annual User Survey

</div>

1.	Bottom Line Return
2.	Rapid Response and Deployment *(Pace)*
3.	Expanding Wealth of Technology
4.	International Competition *(Globalization)*
5.	Unstable Organizational Environments *(Pace)*
6.	Integration

Pace of change, globalization and integration show up directly in the survey findings. "Specialization" was the only business issue which didn't make the list.

3. The Impact of Business Trends on IS

Some of the implications of these major business trends are quite clear. The key issue for the CIO in the 1990s will be how to maximize the organization's flexibility and responsiveness to a constantly changing environment characterized by:

* A growing need for strategic linkages with business partners

* Constantly changing organizational structures and more likely than not an ongoing stream of mergers and divestitures.

* The creation and modification of a rapidly changing stream of products/services.

While the statement made above is generally true, the impacts of the four major business forces or the three classes of firms discussed earlier will vary to some degree.

a. Information Oriented

Information oriented firms will be most strongly affected by globalization and pace of change. Most respondents in the financial services industry anticipate that the market structure and field of competitors will be constantly changing on a global scale.

* New products and services with higher information content will be constantly introduced.

* Deregulation and bank/thrift failures will continue to spur mergers, acquisitions and restructurings at an accelerated pace.

* Telecommunications will become increasingly critical for delivering information, stimulated by both deregulation and globalization.

b. Service Oriented

Service oriented firms are likely to be more equally affected by all four factors. There will be more opportunities for developing specialization in a single existing service function, as well as integrating that function into toher firms' business operations.

c. Product Oriented

Product oriented firms will be strongly effected by all business trends.

* Globalization affects both sources and markets more strongly than for information and service oriented companies.

* Specialization and integration will become increasingly important, in part, enabled by manufacturing technology.

* The pace of change will be very rapid, stimulated by changes in the availability of new information and service support capabilities in the marketplace.

* There will be increasingly levels of technology applied in the manufacturing process as well as embedded in the product itself.

Exhibit V-2 summarizes how the respondents to the study perceive that the three classes of industry will be impacted by the four major business trends. The darker the shading the higher the degree of impact of the business trend on the information systems functions of that industry class.
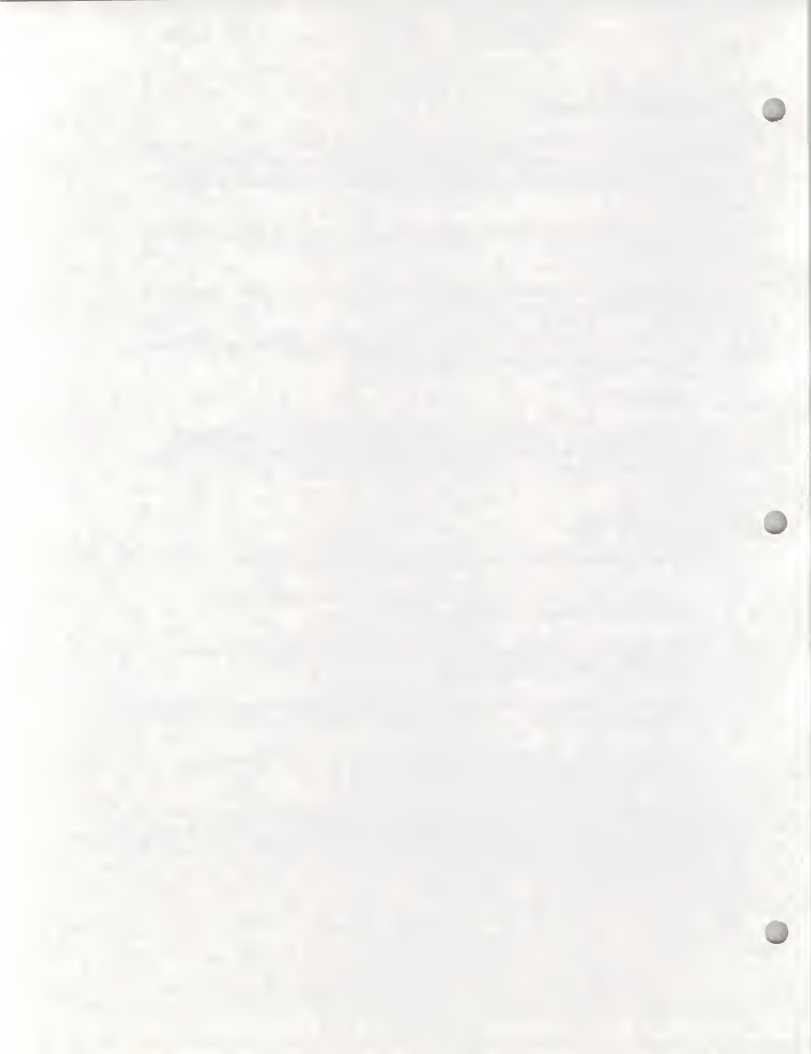
Exhibit V-2
Impact of Business Trends on IS
As a Function of Product Orientation

TREND	PRODUCT ORIENTATION		
	INFO.	SERVICE	PRODUCT
Globalization	■ High	▨ Medium	■ High
Specialization	▨ Low	▨ Medium	■ High
Integration	▨ Medium	▨ Medium	■ High
Pace of Change	■ High	▨ Medium	■ High

■ = High Impact
▨ = Medium Impact
▨ = Low Impact

B
Technology Trends

1. General Conclusions

The study identified a wide variety of new technologies as having potential application in nearly all industries. However, over **90%** of the participating CIOs indicated that technology trends *per se* are not a dominant driving force in their companies. The general view, summarized in Exhibit V-3, was:

* Technology developments proceed independently, and generally ahead of business needs. Put another way, there is already more technology out there than we've been able to utilize effectively to date.

* There is really very little "demand pull" by business as a stimulus for specific technology development.

* There are only a few situations in which technology constraints are a stumbling block to achieving corporate objectives.

* Most technology developments are truly evolutionary and not revolutionary. Functions become cheaper and faster to perform, and entirely new capabilities are few and far between.

* Technology is more predictable than most of the other parameters that must be juggled in the equation of successful applications.

Exhibit V-3
General Conclusions - Technology Trends

- Enabling/Not a Driving Force
- Evolutionary/Not Revolutionary
- Seldom A Stumbling Block
- More Predictable Than Business Situation

While these views may appear to down play technology's importance of as a key driver, decisions surrounding how and when new technology is applied appear to be critical to most of the CIOs sampled in the survey. Most perceived that the process of justifying new technology has changed in the past several years. While in the past new technology was could only be justified on a "sound" investment decision, today most CIOs feel that its application can, and will be justified on the basis of providing unique business opportunities or keeping up with the competition. If you will, a three tiered view of the need structure.

* *Comparative Advantage* - The new technology or system is justified on the basis that there is some demonstrable business advantage (in addition to simple cost reduction) that the technology will give the company that competitors don't have.

* *Comparative Parity* - The new technology or system will provide a capability that competitors in the industry have which will maintain equity.

* *Comparative Necessity* - If the new technology is not employed, there is a clearly understood disadvantage which could threaten a company's market position or survival.

Airline reservation systems are a good example. After American clearly gained *comparative* advantage with their system, it would be hard to argue than any of the followers had much choice but to invest in comparable technologies to achieve *parity*, or for that matter, simply to survive. A number of the CIOs who participated in the survey commented that as the "copy cats" fall in line there is frequently an opportunity to leap-frog the original innovator through the application of a superior technology. But the advantage is almost always short-lived. One CIO commented, "... *if I'm doing my incremental thing over an already successful system, the best I can hope for is a six to nine month advantage.*"

The second biggest issue surrounding technology also involving timing. It has to do with which underlying architectures to select and when to commit to them. Many of the CIOs interviewed felt that in order to maintain the flexibility to adapt to new business decisions, they must set underlying architectural standards which would have guaranteed future migration paths. With the variety of technologies available, and the constant pressure to be flexible, making the right choices in this arena is certainly critical.

INPUT believes that technology is a significant driving forcer. Not that the technology itself is usually a prime motivator, but because the decisions, cost justified (productivity) or strategy motivated, that must be made surrounding technology are becoming key to successful business strategy. The comments of of the interviewees clearly support this notion.

2. Views on Specific Technology Trends

Section B of the questionnaire provided an opportunity for the interviewees to express their views on current technology trends as well as some emerging technologies which are likely to have significant impact over the next decade. To stimulate discussion, INPUT provided a representative list of each and asked the CIOs to discuss whether/how they were using these technologies today, and what they felt the future impacts of these technologies might be. The remainder of this section analyzes their comments. In some instances additional information has been provided from *INPUT's Annual User Survey* of 250 IS executives to provide a contrasting view or support this survey's results with a larger sample.

a. Integrated Enterprise-Wide Databases

Without exception, the CIOs surveyed see a growing and continuing trend toward the integration of data bases. However the scope of these data bases tend to be along "lines of business" rather than enterprise-wide. At least **60%** of the sample indicated that they were looking to relational database technology as the primary facilitator in accomplishing the further integration of data, and virtually **100%** of this leading edge group have been using some sort of relational technology in "production" for some period of time. *INPUT's Annual User Survey* addressed the same question to over 250 IS executives, but also qualified the question on the basis of whether the technology was being utilized on a production basis by the IS shop or end users. The results are summarized in Exhibit V-4.

Exhibit V-4
**Relational DBMS Application
Who's Using It?**

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While the full sample of 250 companies from *INPUT's Annual User Survey* does not reflect the 100% utilization indicated in the "leading edge" sample surveyed in this study, it does give a strong indication that relational data base technology will be key in the coming decade.

Data from both surveys indicate that IS executives see the application of relational technology as limited only by the technology's ability to deal with high volume transaction applications. They expect that limitation to decrease as newer versions of existing relational packages come onto the market within the next 2 to 3 years.

b. On-Line Transaction Processing (OLTP)

The vast majority of survey respondents felt that by the end of the first half of the next decade virtually all transactions would be handled on-line. Clearly, this is is the case in the information oriented industries, and increasingly in the service and product oriented companies. *"There will always be some kind of batch processing"*, commented one executive, *"but it's becoming like that old 083 sorter in the basement of the data center... increasingly difficult to find."*

Relational DBMS Application
Who Is Using It?

Bar chart titled "Relational DBMS Application — Who Is Using It?" with y-axis "Respondents (Percent)" ranging 0 to 80. Legend: IS, User. For "Using": 61, 37. For "Not Using": 39, 63.
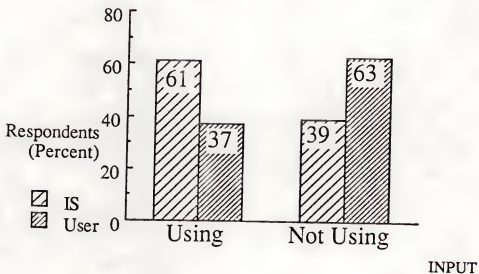
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INPUT believes that as we move into the next decade, there will be a need to redefine what is meant by on-line processing. Clearly, everything in the data capture and inquiry area is moving in that direction regardless of industry. But the advent of cooperative processing and the partial or stage-wise processing of complete transactions will cause some rethinking in this area. Regardless of the formal definition, from the point of view of the end user, most everything from the creation of and distribution of documents to servicing inquiries will clearly appear to be on-line in the not distant future.

c. CASE Technologies

Views were strong on this subject. Every company in the sample has invested to some degree or the other in the examination or utilization of a variety of application development tools that could be put under the heading of CASE (Computer Automated Systems Engineering). Although there is a strong belief that this technology will have a significant impact in the next decade, there was almost universal agreement that the results are disappointing to date. The primary reasons are:

* The majority of tools are only applicable to new systems, while 60-75% of the work at hand in most shops is clearly maintenance. To quote one executive, *"You can't make great speed forward while dragging the anchor aft"*.

* There are few if any fully integrated systems that are effective. Most focus on only a small part of the total system life cycle, and frequently the least costly part in comparison to total systems development costs.

* The real interest is in achieving speed and accuracy on the front end, and practical systems that deal with that aspect of the life cycle are just now coming into the market.

Despite this general level of disappointment in CASE tools, optimism remains high. Many of the executives interviewed could be considered pioneers in the promotion of CASE concepts; and even though recovering from some "arrows in the back", believe that effective CASE methodologies and tools will have the single biggest impact on systems in the next decade.

d. Expert Systems

Within the sample, the primary applications of expert systems today occur in the banking/finance, and manufacturing segments of the population. However, data from the *INPUT's Annual User Survey* indicates that there are also production applications in transportation, utilities and other industries as well. Most interviewees see the next decade as a time when much more extensive use of this kind of technology will occur in all industry sectors.

However, it is interesting to note that very few respondents see commercial application of expert systems as an earth shattering event. Most perceive that utilization of the technology will be highly specialized, and typically will involve embedding "decision assisting" technology within the context of otherwise structured applications.
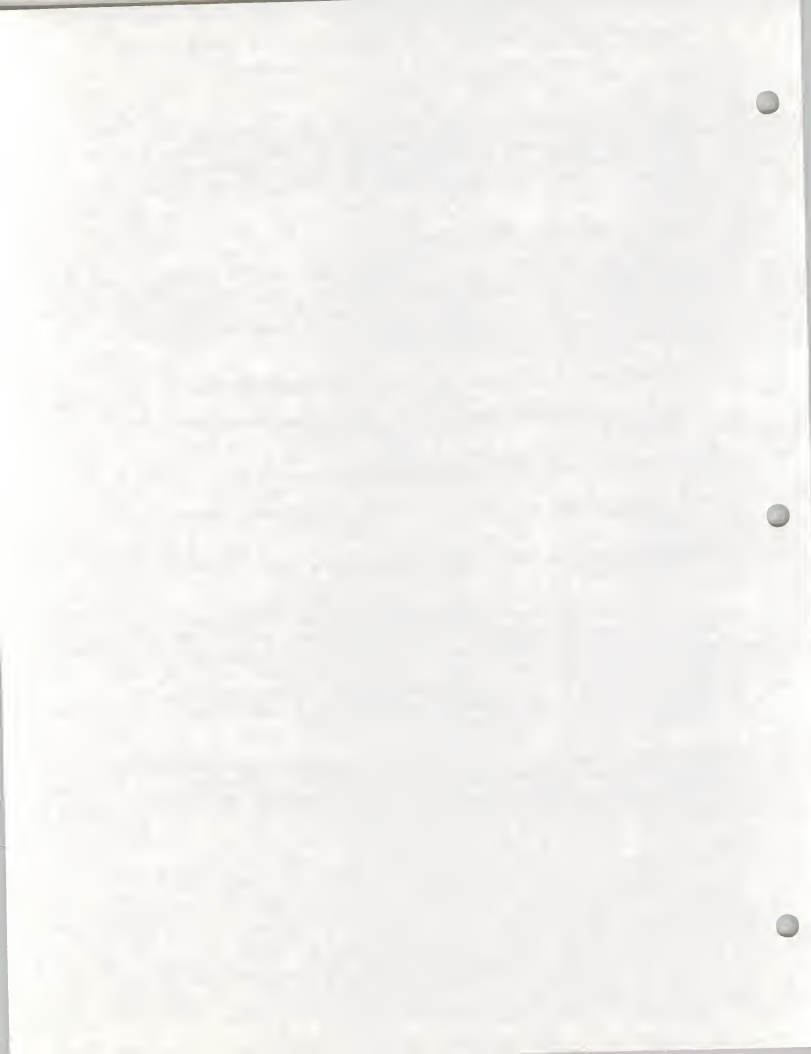
e. Platform Independence/Systems Connectivity

The vast majority of respondents see this trend as significant in the next decade, although they are clearly divided on how fast platform independence and high level connectivity will develop. At least **50%** were, to say the least, skeptical that real progress will be made in this area until the mid nineties. A number of reasons were given for why this trend is important, including:

* Minimizing the need for in-house investments in technology integration.

* Reducing of the risk and reducing the "back-out" cost of bad architectural decisions.

* Creating opportunities for the rapid introduction of new technology.

* Facilitating the rapid development of inter-company and industry wide strategic systems.

* Reducing the time required to migrate to new more cost-effective hardware environments.

In general it was impossible to separate the discussion of these trends from a discussion of general developments in hardware and software. Almost all the survey respondents were enthusiastic about developments in hardware over the next decade. Dramatic improvements in on-line storage capabilities and telecommunications headed the list of technologies that they felt would have the biggest impacts. Other technologies which were frequently mentioned included parallel processing and super workstations.

Although the survey respondents were not asked to rank a specific list of technology trends on the basis of their impact on the next decade, INPUT did attempt to develop such a list through examination of the individual responses. INPUT's ranking is contained in Exhibit V-5.

Exhibit V-5
Ranking of Key Technology Trends

1.	Integrated Data Bases (Relational)
2.	Platform Independence/Systems Connectivity
3.	CASE Technologies
4.	Expert Systems
5.	On-Line Transaction Processing Capabilities

3. Views on New Technologies

Respondents were also asked to comment on technologies that might have a revolutionary impact on information systems over the next decade. As in the case of technology trends, interviewees were prompted with a list of potential technologies such as voice recognition, natural language processing, self-teaching expert systems and image processing.

As in the case of technology trends, respondents were not asked to rank technologies in terms of impact or importance. However, of the four mentioned above, it was easy to develop a ranking from the responses of the interviewees. Exhibit V-6 gives INPUT's ranking.

Exhibit V-6
Ranking of Impact of New Technologies

1.	Image Processing
2.	Voice Recognition
3.	Natural Language Processing
4.	Self-Teaching Expert Systems

Some comments on this ranking are in order.

* There is a big distance between the first two and the last. Most respondents felt that image processing and voice recognition will offer greater opportunities in the immediate future than either natural language processing or self-teaching expert systems.

This response is not surprising. Image and voice recognition (assuming the appropriate price/performance developments in storage capability) provide immediate opportunities for significant changes in how massive quantities of information can be stored, manipulated and communicated. In particular, information which otherwise requires heavy investments in coding and data entry could be managed on a direct entry basis. According to at least 8 respondents the opportunities for systems which would revolutionize customer and internal communications interfaces will be truly significant.

* Natural language processing and self-teaching expert systems were though of as technologies with significant potential, but not likely to yield the kind of dramatic opportunities that image and voice capabilities will create.

4. Conclusions - Technology Impacts

Most leading edge IS executives see business trends as having more significant impact than technology over the next several years. However, they all acknowledge that fundamental technology developments are an ongoing underlying force impacting the opportunities for the development of strategic systems, as well as controlling the timing of key decisions involving architecture and standards.

Based on INPUT's analysis of the responses to the survey, the highest impact technologies will most likely be those involving the management of data, and those which move toward platform independence. Continued developments in voice and image management and processing will likely provide the greatest opportunities for rethinking entire applications suites in many industries. Continued developments in workstation price performance, graphical interfaces will also create significant opportunities to extend corporate applications directly into consumer and other markets.

By the middle of the decade, INPUT believes that CASE technologies will finally begin to impact the development process in such a way that the capability of the IS function to respond in a timely manner to business opportunities will be significantly improved.

VI
Future of the Information Systems Function

The importance of information technology will increase across all industry sectors, and in virtually all aspects of business in the 1990s. This increasing integration of information technology into the business infrastructure of corporations will elevate the need for information systems functional expertise at both the senior management and operating unit levels. Consequently, it's safe to say that the CIO's role won't vanish over the next decade. The objectives and problems of the position will be similar to those of today, and comparable to those that other senior executives face.

* The job will become increasingly people oriented, and human nature doesn't change. Salesmanship, education, compromise and leadership will be critical skills.

* The pace of change will continue to increase, making it both harder and more critical to plan and manage functional specialities, in this case information technology.

Nevertheless, the trends discussed earlier in this report and summarized in the following section are likely to impact the organization, responsibilities and areas of emphasis for the IS function over the next ten years. The remainder of this chapter summarizes these trends gives INPUT's views on how organizational structures, network and development environments, and user responsibilities are likely to evolve in the next decade.

A
Summary of Key Trends

Pulling together what has been learned through this study with the information gathered in *INPUT's Annual User Survey*, INPUT believes that there are several overall trends, summarized in Exhibit VI-1, which will shape the IS function in the next decade.

* **Business Integration - Within Companies** - The trend toward a higher level of integration of staff and line functions within individual businesses will place increasing demands on information systems for higher volumes and greater varieties of information. Furthermore, the increased pace of business will demand that this information be provided, for all practical purposes, on a real-time basis.

* **Business Integration - Between Companies** - The trend toward conducting routine business transactions between companies on an electronic basis is only in its infancy. INPUT believes that as the trend grows, the incorporation of additional information from third party repositories such as industry oriented data bases or financial institutions will also become routine.

These trends toward integration will coupled with the rapid pace of technological changes will elevate the importance of technology planning and architectural strategy during the next decade.

* **Decentralization of Technology** - Decreased cost (reduced economies of scale) and increases in the user friendliness of technology will continue the existing trend toward decentralizing information technology resources and aspects of both the development and operations functions to business units. This decentralization is consistent with the objectives of most CIOs participating in the study, who perceive that increased user involvement is critical to conceptualization and implementation of strategic systems.

  This trend, along with the two discussed above, will also have the effect of increasing the central focus on technology planning, since successful decentralization of development cannot occur successfully outside the context of a well-defined corporate architectural plan.

* **Increasing Use of Communications** - The trend toward increasing use of communications (both internally and externally, implies that corporations and CIOs will have to adopt a "network view" of the corporation. With limited exceptions, emphasis will shift from economies of scale in centralized data processing to economies of scale and requirements for control of large networks.

* **Emphasis on Business Planning** - Emphasis on business planning will increase, with the CIO providing strong support to increasingly independent business units. And, while technology strategy will be set at the corporate level, the CIO will provide guidance and support to help business units establish their own technological directions within the architectural framework established by the CIO.

Exhibit VI-1
Key Future Trends - Impacts on IS

TREND	IMPACT ON IS
Business Integration - Within Companies Business Integration - Between Companies Decentralization of Technology	Centralization of Infrastructure Planning
Increasing Use of Communications	Network View of the Corporation
Emphasis on Business Planning	Decreased Involvement In Operations

INPUT believes that these represent the primary trends and resulting impacts on information systems functions in general. However, as discussed in Chapter IV, the degree of impact will be tempered by the information intensity and nature of the product. The key areas which will vary as a function of the nature of the information intensity (information, service or product focus of the business) are in development, and to a somewhat lesser degree in the area of operations.

* Businesses dependent upon applications with high transaction volume rates which require access to huge data bases are not likely to see much decentralization of either the development or operations responsibility. Neither the technology or control procedures are likely to exist which would permit effective decentralization in these cases. On the other hand, many other types of applications in the same firms which have been traditionally managed centrally, but don't have the same processing characteristics, will begin to migrate to operating units within the context of corporate IS standards.

* Businesses with very diverse and generally unrelated business units will see a mixture of centralization and decentralization of operations and development, dependent upon the information intensity of the individual business units.

To summarize, all the key trends point to information technology becoming an imbedded part of the business structure. The more imbedded it becomes, the more the responsibilities for its management will tend to follow the organizational patterns proven effective for the nature of the business in question.

B
IS Organizational Structures

Despite the fact that management responsibility for specific aspects of the information systems of a business will vary by industry, INPUT believes the general trend in the next decade will be to move toward a split in responsibilities between central IS and business units analogous to the division of responsibilities between the split between the federal and state governments of the United States. Exhibit VI-2 shows how a split of these responsibilities might be constructed; where Corporate IS could be viewed as playing the federal role, and unit IS, the role of the state government.

Exhibit VI-2

Use JJ88-DT1-12

1. Corporate IS Role (Federal)

INPUT believes that the corporate role will become more outward looking over the next five to ten years. Much like the federal government, corporate IS will focus will look to a broader community in terms of understanding the competition and key information technology strategies that will be required to meet the organizations objectives. Just as the federal government holds primary responsibility for international relations, the top IS executive will need to have an increasing understanding of the competition in his company's community of business interest.

Similarly, the corporate IS function will need to have primary responsibilities for determining who the firm's strategic partners should be in order to achieve the goals of the information systems function. Whether selecting key vendors to supply applications systems, or critical architectural technologies, alliances will be required. Doing it all from scratch will not be an acceptable strategy in the 1990s.

Corporate IS will assume a powerful role in policy and standards from both a procedural and technological viewpoint. One can hardly imagine the U.S. functioning without centralized control of standards for hundreds of things, ranging from the monetary system to the gauges of railroad tracks. The situation will be increasingly similar in IS. The more decentralized the actual execution of tactical IS responsibilities become, the greater the requirement that the entire function be carried out within the context of flexible, but meaningful standards.

Federated IS Organization

Corporate IS	Unit IS
• Competition	• Customers
• Partnerships	• Business Support
• Standards	• Operating Systems
• Corporate Systems	• Policy
• Corporate Policies	

NOTES:

JJ88-DT1-12

Finally, in most businesses there will be applications and services which are most cost effectively provided for all business units on a centralized basis. Military protection and management of the monetary system are two that comes to mind in the federal government context, but it's pretty easy to imagine analogous situations where it clearly makes sense to have corporate IS perform a function for the entire corporation. Besides the development and management of multi-divisional systems, the most important of these is likely to become the management of the corporate network and the evolution of the infrastructure to support operating unit demands for new applications and systems.

2. Business Unit Information Systems' Role (State)

INPUT believes that the IS responsibilities of business units, many of which will have their own information systems organizations, will become more analogous to those that state governments play. State governments are increasingly involved in the direct administration of programs and systems that impact their customers, the citizens. INPUT believes that systems controlled by the operating units in the nineties will be the ones having the direct interfaces with the customers of most major corporations. By and large, they will operate these systems on networks controlled by corporate IS.

Just as state government is responsible for administering a large amount of federal policy, business unit IS will undoubtedly be responsible for administering corporate policy in information systems. Likewise, they will be responsible for creating and administering policy within the context of the corporate framework.

While the analogy is far from perfect, it presents another way to look at the centralization/decentralization issues involved in the management and organization of information systems in the 1990s.

C
Network Environments in the 1990s

Based on the work conducted in this survey, as well as the information gathered in *INPUT's Annual User Survey*, INPUT believes that a fundamental transformation in the importance of networks is already underway, and will continue into the 1990s. As was pointed out earlier, most of the CIOs interviewed feel that one of the primary developmental and operating responsibility that will remain at the corporate level will be the architectural planning, implementation and management of the corporate information network. Although definitions of the "network" were hardly consistent among those interviewed, some underlying themes were.

* The trend away from application "captive" or single function networks is well underway, and will accelerate in the early 1990s. As dumb terminals have yielded to PCs and higher powered workstations, they have increasingly been utilized to
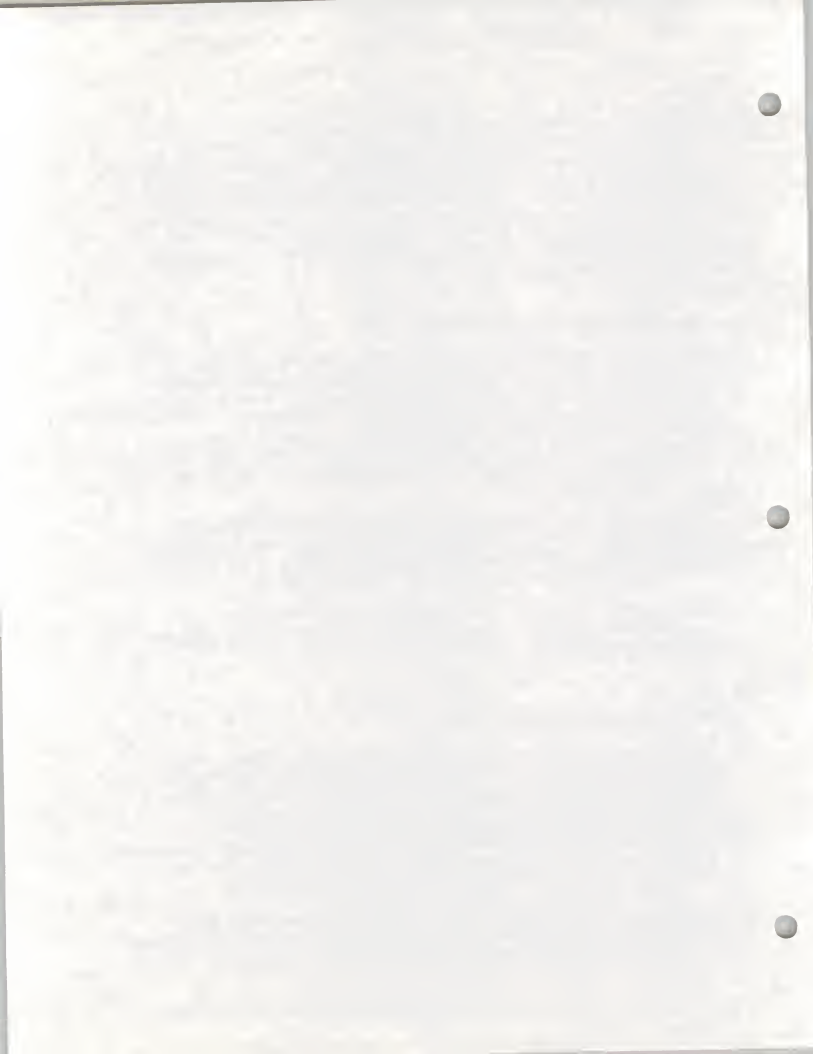
perform more than one function. The resulting demands for the "network" to provide more general purpose communications paths has resulted in the re-engineering of application specific networks into more general purpose conduits to serve multiple applications through a general purpose workstation.

* At the same time, the sources of information required to perform processing for this variety of applications has expanded rapidly. Providing the pathways that will allow for the efficient communication of information between the workstation and host environments, distributed processors, and the workstation on the next desk has elevated the complexity of network design, and for all practical purposes destroyed the notion of the purely hierarchical network. As a result more and more intelligence, as well as processing capability will continue to be built into networks. The opening of network gateways to institutions outside the corporation will only add to the complexity.

* Finally, the addition of new forms of digitized information, namely image and voice, will ratchet up the complexity and importance of networks in the 1990s.

Perhaps the best way to picture where the 1990s will take networks is to reverse the topological view of the last decade which paints a picture of the workstation as a slave to the network, to one where the workstation becomes a window to multiple information sources. Exhibit VI-3 depicts that view.
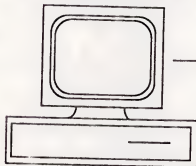
Exhibit VI-3

Use JJ88-DT1-13

Network Environment

Intelligent Workstation =

Window to Information Services

- Local
- Distributed
- Central
- External

NOTES:

JJ88-DT1-13

D
Development Environments in the 1990s

Just as the development of the network infrastructure will become a key thrust of the 1990s, so will adoption of new techniques for the creation of applications and the management of existing applications portfolios. The next decade will probably see the first widespread development of truly distributed systems; i.e., applications where the data involved in processing transactions and/or the actual processing will occur across a network, rather than in single processor environments. Interpreting loosely, cooperative processing is IBM's description of this type of environment. But the logical extension of the concept beyond IBM's proprietary definition, is probably best embodied in the kinds of capabilities that products like ORACLE have brought to the market. The survey results indicate that there will be two keys to the effective development and deployment of these types of systems.

* Applications will need to be build such that the data is independent from the application it serves. Many of the methodologies and software products required to achieve this objective are already here, but putting them together to generate applications which provide the security and integrity levels demanded by most of today's production environments will be a challenge for the next decade.

* Standards and development tools will need to be put into place to ensure that platform independence of applications code can be achieved. It's possible to achieve this goal to a limited degree today; but lots of the pieces are missing from the puzzle, and standrards are slow to evolve.

In the broad context, how quickly these and the other development objectives of the 1990s can be achieved will be dependent upon the continued evolution of CASE. The survey indicates that most of the CIOs who have invested in CASE, have been disappointed in the results. However, almost all felt that the corner was about to be turned. If the objectives for the 1990s involve truly distributed systems, and the capability to rapidly modify and deploy more traditional applications, CASE methodologies will become a necessity, not only to handle the growing technical sophistication of new applications, but also to deal with the sheer organizational complexity of the next decade's development environment.

In the next decade, to some degree or another, systems development will be performed by corporate IS, unit IS functions and users. Furthermore, any one of those organizations will become increasingly likely to go to outside vendors for solutions to information technology based problems. This will result in a complex systems development environment, as depicted in Exhibit VI-4.
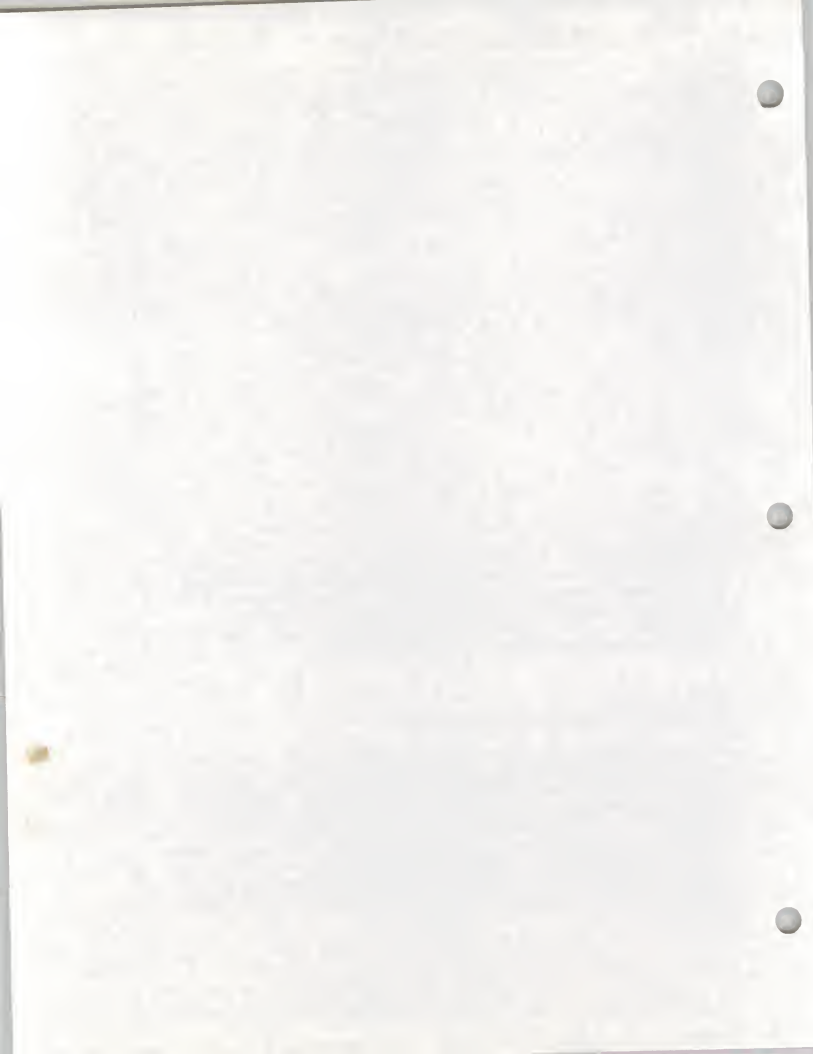
Exhibit VI-4

Use JJ88-DT1-14

As will be the case with network architecture, the corporate information systems function will take a strong position on all aspects of development methodology utilized in a distributed development environment. Particular emphasis will need to be placed on those aspects that deal with data architecture, definition and management. Putting the appropriate development environment in place will be a critical success factor for IS executives over the next five years.

E
Role of the Information Services Vendor

Over the past five years IS executives have increasingly looked to outside vendors and systems integration contracts to implement major new applications. All of INPUT's vendor research supports the notion that companies are increasingly willing to buy complete solutions, and hold the contractor liable for delivery of the implementation. INPUT's market forecasts for 1989 indicate that the CAGR (Compound Annual Growth Rate) for systems integration over the next five years will be in the neighborhood of 25%. And recently, there has even been a sharp increase in the demand for facilities management (systems operations) services. The CAGR for systems operations is forecast to be 18% between 1989 and 1994.

Development Environment

Business Requirements

Corporate IS — Unit IS | User — External Source
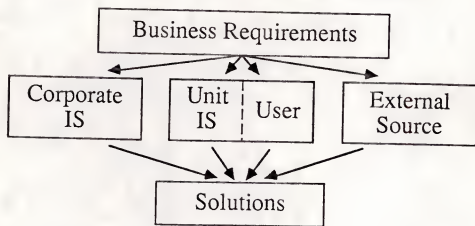
Solutions

INPUT

NOTES:

INPUT

INPUT's Annual User Survey for 1988 also supports the idea that buying solutions from outside is a growing trend. It showed that outside resources would account for approximately 60% of the dollars to be allocated to the development of major new applications in 1989. The majority of these dollars would be spent on professional services, software or systems integration contracts.

Interestingly, the research conducted specifically for this study is ambivalent on the subject of using outside services. Based on an analysis of the data there appears to be a modest preference to control critical projects from the inside. On the other hand, at least amongst this group of leading edge IS executives, there is a high degree of openness to acquiring critical or scarce professional skills, specialized or applications software on an as needed basis. But the survey respondents for the most part did not see "going outside" as a major trend. INPUT believes that there may several explanations for this apparent discrepancy.

* The survey sample for this study is dominated by IS executives from extremely large corporations, some of whom see *themselves* as systems integrators. They typically are equipped with qualified personnel and have a proven track record with regard to successful implementation of major new development efforts. At least for the moment, they see little need for their own organizations to go outside.

* Many of these executives have been doing leading edge development projects utilizing vendors as alliances for years, and consequently view the relationship as more of a development partnership than a "contract for services".

* The sample doesn't include operational executives, who have become major buyers of outside vendor services in recent years.

While the data in this area is somewhat inconsistent, INPUT doesn't believe that the trend toward outside buying will subside. As the focus of IS executives moves more toward strategy, the rebuilding of infrastructure and rapid response to business driven technology opportunities, most will find it effective to tap the information services market for specialized application or technological expertise. In fact, INPUT believes that a growing sophistication to determine how and when to use the expanding capabilities of the information services industry will become critical for the majority of IS executives in the next decade.

We have seen some fundamental changes in the relationships between vendors, IS and user executives develop over the previous two decades. INPUT believes that these trends will continue. There was a time when the hardware provider was almost the only source of outside product, service, or for that matter, practical consulting knowledge. Today's information services industry provides a variety of cost effective and specialized options which can hardly be overlooked by the information systems executive or his partners, managers of major business units.
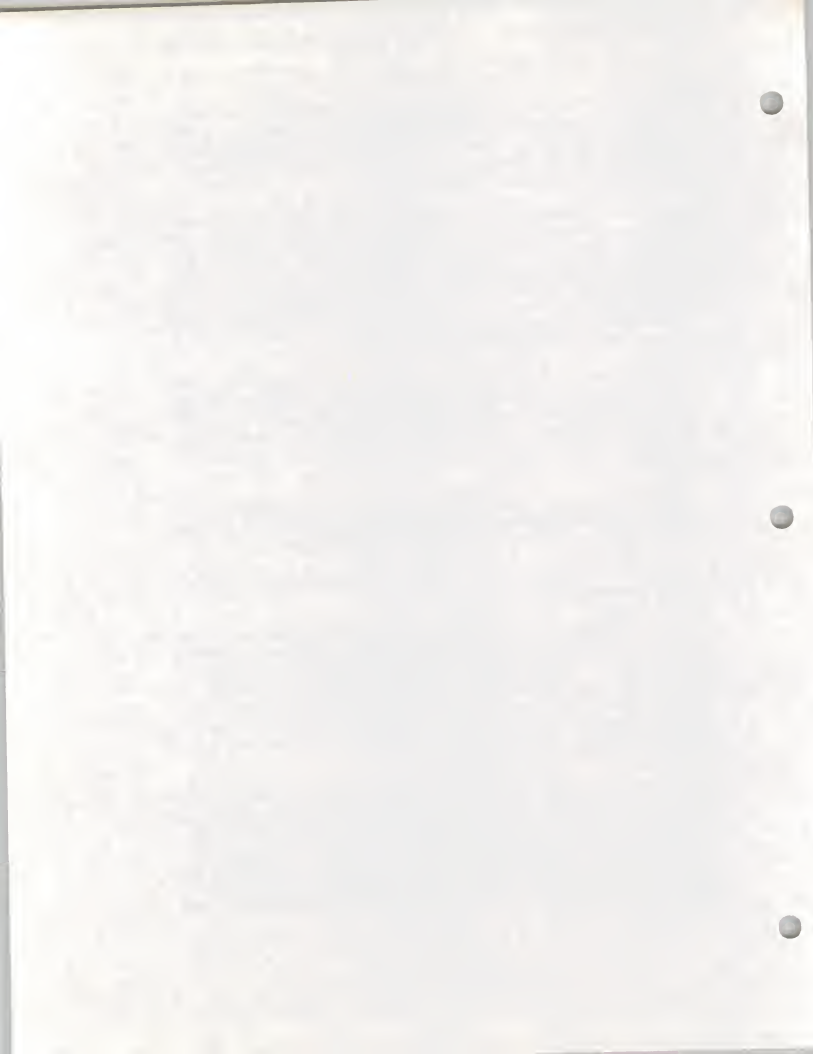
F
Final Thoughts on the Future

As information technology becomes further imbedded in the customer service, delivery mechanisms, and products of most companies the effective management of all aspects of information systems will become more critical to achieving success at all levels of the corporation. This driving force will continue to result in changes in the organization, role and structure of information systems in the 1990s. There will be a continued increase in the amount of responsibility assumed by users in the management of IS. Exhibit VI-5 indicates those areas where the responsibility shift will continue to occur.

Exhibit VI-5

Use JJ88-DT1-15

This responsibility shift should not be seen as simply a "takeover" strategy, or as a political reaction to poor response from the "centralized" information systems function. While these clearly could be, and have been motivators for the responsibility shift in some organizations, INPUT believes that the trend is a result of the growing maturity and pervasiveness of the IS function.

* As operating management recognizes its dependency on information technology, as well as the potential strategic opportunities it can create, becoming more involved is not only natural, but healthy.
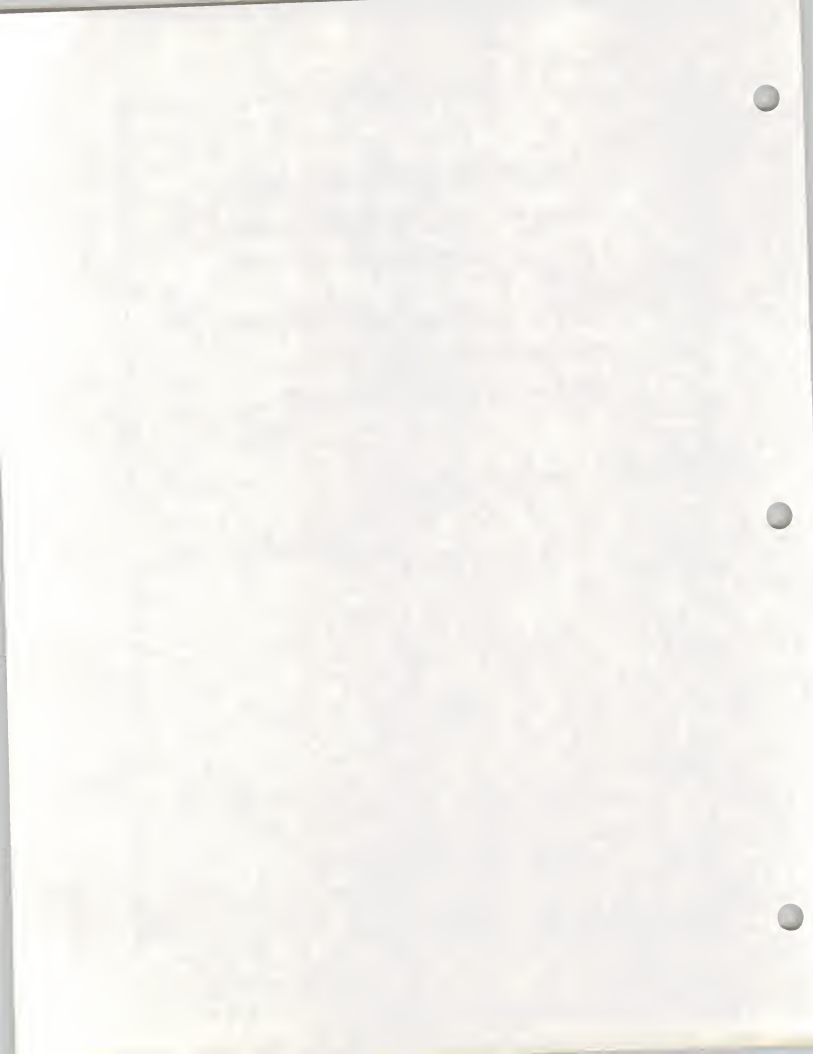
Responsibility Shift to User

- Manage Tier-Two & -Three Processing
- Do Significant Portion of Application Development
- Manage Tier-Two & -Three Data Bases
- Control Tactical IS Decisions
- Self Satisfy Information Appetite

NOTES:

* As the technology continues to become less expensive and easier to use, it will become accepted, as just another tool.

Does all this imply a decrease in importance of centralized management of the IS function in the vast majority of businesses? Certainly not. To some degree, INPUT envisions more centralization of critical elements of the information systems activity in the next decade. As pointed out earlier in this chapter, INPUT believes that highly centralized control will remain over networks, architecture (data, communications and applications) and development methodologies... in other words, the information environment.

To some degree this centralized control, coupled with a high degree of decentralized execution is not dissimilar to the way in which the financial function operates in most corporations. Certainly, money, as is the case with information, must be viewed as a corporate asset. Is the property of the chief financial officer? Certainly not, but executive management looks to the CFO to advise on its strategic utilization, and provide the standards and processes for its management throughout the firm. The situation is similar in the case of information.

So what will the corporate information systems function look like in the 1990s. Exhibit VI-6 gives INPUT's view.
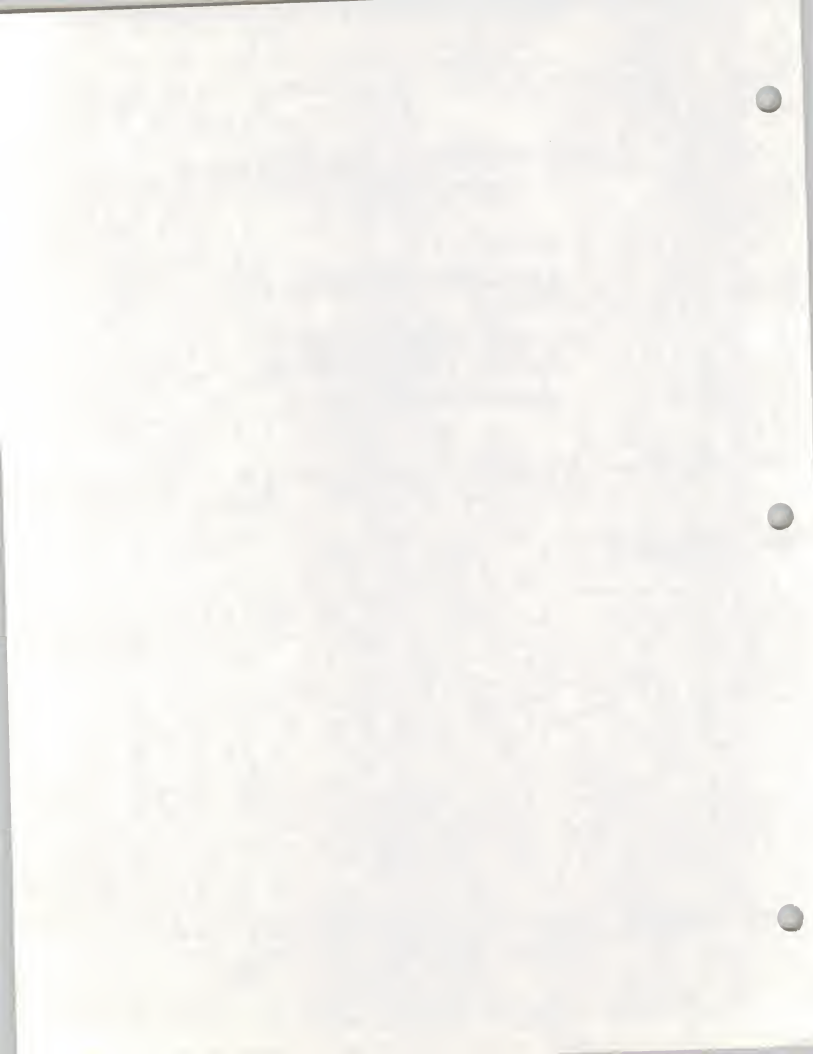
Exhibit VI-6

Use JJ88-DT1-18

Corporate Information Systems Organization Style

- Smaller
- Expert Based—Technology and Business
- Consulting Style—Information Engineers and Solution Builders
- Marketeers for Technology

NOTES:

JJ88-DT1-18

* As more and more of the people intensive "doing" migrates into the operating divisions of the corporation, we can anticipate that the corporate IS function will become smaller in size.

* INPUT also believes, that the function will become more expert based. Two types of expertise will dominate, business and technology. The business expertise will be focused on the development of strategic applications of information technology; and the technical expertise will be focused on the key areas of architecture, network and applications development technologies.

* This central base of expertise will act as a consulting resource to operating units in addition to providing direct support to the central function.

* And, INPUT believes that the corporate function will take a proactive or "marketing" role for the effective application of technology throughout the corporation.

If this vision of the IS function is true, than the shape of IS leadership will undergo some change in emphasis in the coming years. (See Exhibit VI-7) To achieve success, the CIO of the next decade will need to think like a strategist, function as a consultant, effectively manage infrastructure and facilitate the orderly growth and application of information technology on a corporate-wide basis. A challenge, and an exciting opportunity for leadership.

Exhibit VI-7

Use JJ88-DT1-19
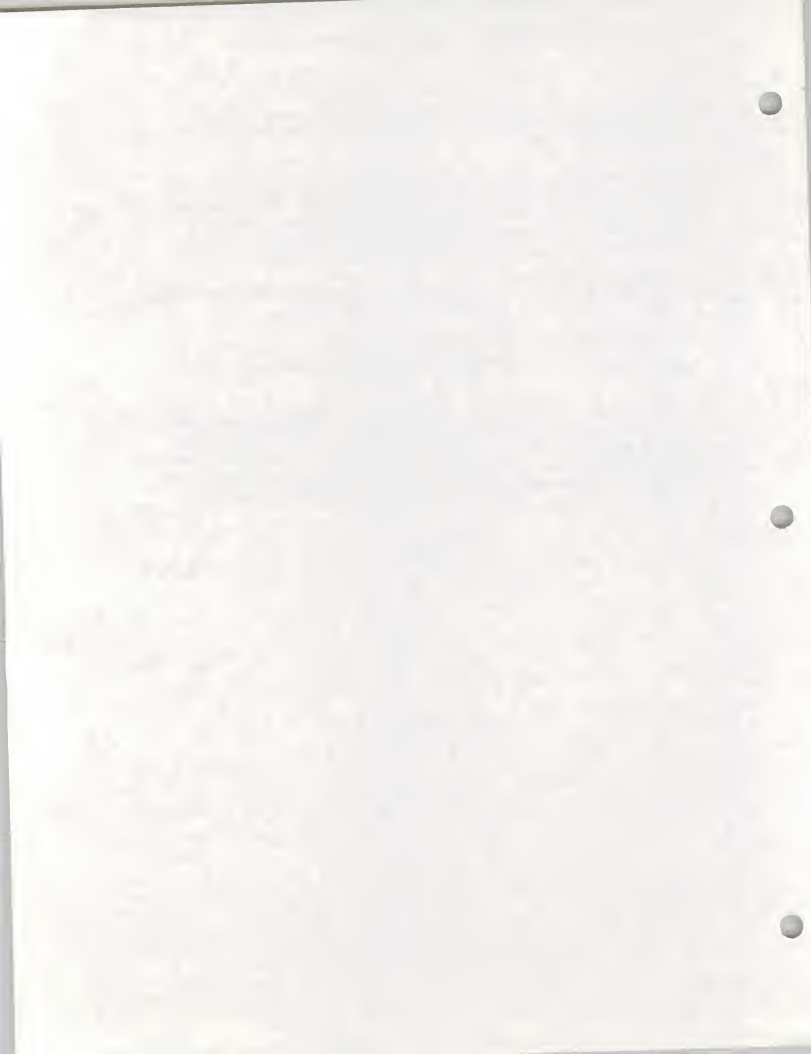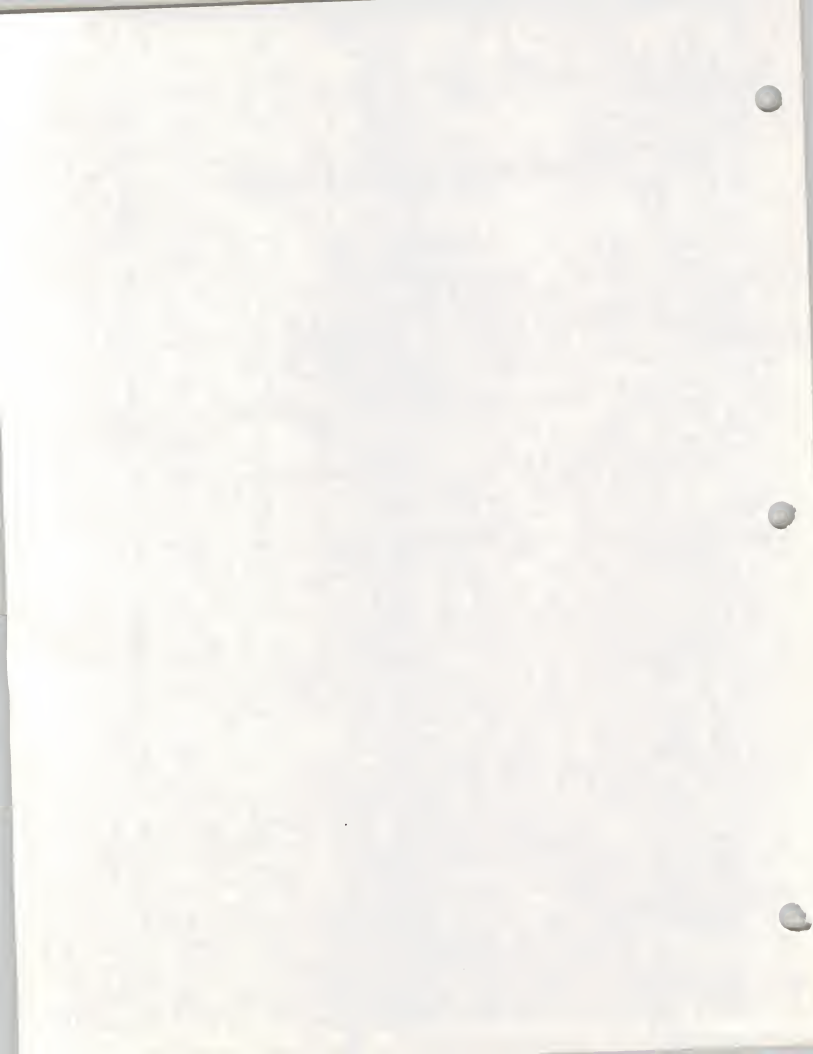
Information Systems Executive

An Internal "Systems Integrator"

NOTES:

JJ88-DT1-19

Appendix A
Interview Sample

The alphabetical listing in Exhibit A-1 contains the names of companies that were interviewed as part of this study. With the exception of those companies identified as "Expert" in the INDUSTRY column, the top information systems executive or CIO participated in the interview. The names of the "Expert" participants are listed after the table.

Exhibit A-1
Organizations Participating in the Survey

COMPANY	INDUSTRY	TYPE
Aetna Life & Casualty	Financial Services	Telephone
American Airlines	Transportation	Telephone
American Medical Laboratories	Medical	Telephone
American President Companies	Transportation	Personal
Apple Computer	Discrete Manufacturing	Personal
Assoc. For Computing Machinery	Expert	Personal
AT&T	Telecommunications	Telephone
Blue Cross of Western PA	Insurance	Telephone
Brunswick Corporation	Discrete Manufacturing	Personal
Carter Hawley Hale	Retail Distribution	Personal
Control Data Corporation	Discrete Manufacturing	Telephone
Dexter Corporation	Discrete Manufacturing	Telephone
Dupont	Process Manufacturing	Telephone
Equitable Life	Insurance	Telephone
Fannie Mae	Financial Services	Personal
Federal Home Loan Bank of Dallas	Financial Services	Telephone
First Chicago Bank	Financial Services	Personal
Harvard Business School	Expert	Telephone
Helene Curtis	Process Manufacturing	Telephone
Information Resources Inc.	Services	Personal
Johnson, Smith & Knisely	Expert	Personal
Massachusetts Mutual Life	Financial Services	Telephone
Mellon Bank	Financial Services	Personal
Merrill Lynch	Financial Services	Personal
Moore Business Forms	Discrete Manufacturing	Telephone
Pacific Telecom	Telecommunications	Telephone
Pacific Telesis	Telecommunications	Personal
Pepsico	Process Manufacturing	Telephone
Polaroid	Discrete Manufacturing	Telephone
Rockwell International Corporation	Discrete Manufacturing	Personal
Sun Company Inc.	Process Manufacturing	Telephone
Travelers Insurance	Insurance	Telephone
United Parcel	Transportation	Telephone

Harvard University - **Dr. F. Warren McFarlan**
Association For Computing Machinery - **Mr. Richard Hespos**
Johnson Smith & Knisely - **Mr. Skip Tolette**
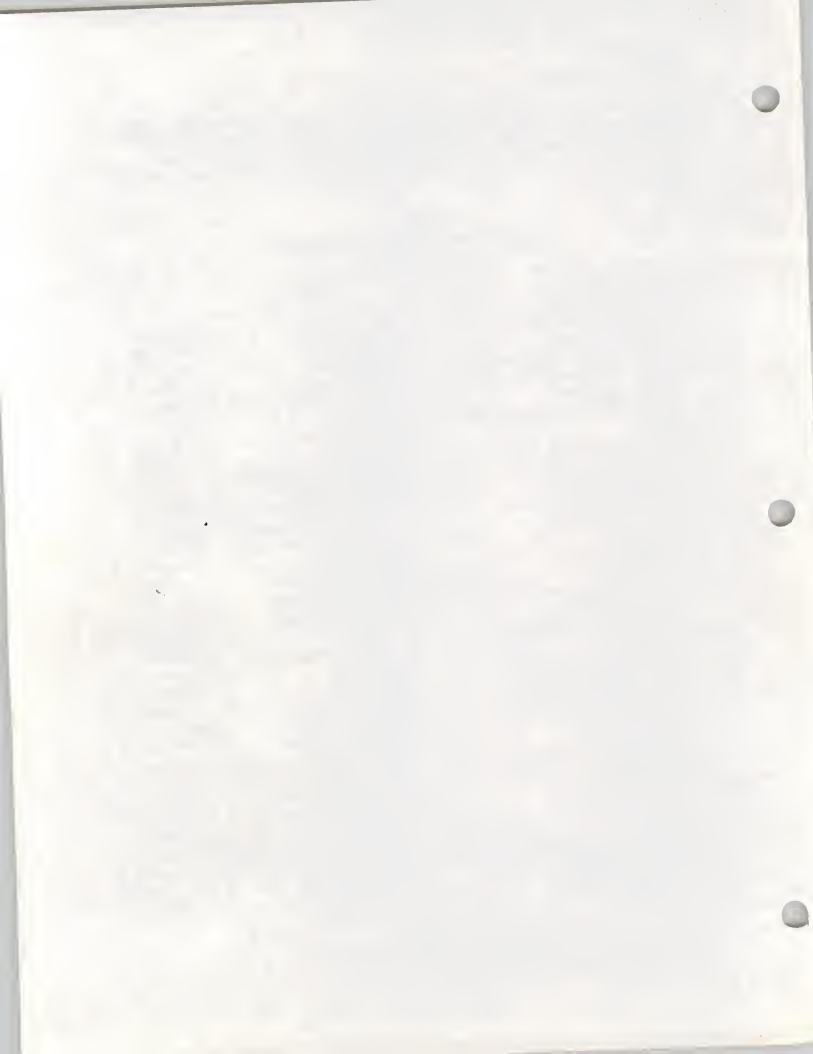
MEMORANDUM

TO: Denny Wayson   8/15/89 @ 1415

FROM: Norman G. Litell

RE: CIO Responsibilities Chart (Ex IV-2)

I am having difficulty with the Systems Development and
Operations segments of the chart.

In each of the other three functional areas, we have listed
the type of responsibility the CIO has for that function at
two organizational levels: Corporate and Business Unit.
The format of the presentation is action verbs: develop,
formulate, execute, etc.

For Syst Devel and Ops, we have shifted format to list types
of systems or operations for which the CIO has some level or
type of responsbility, but we haven't said what the does:
does he advise, review, manage, or ???

The point of defining the specific action responsibilities
in each functional area was that the overall role of the CIO
is described in terms of how these action responsbilities
are shared between the CIO and the Business Unit managers.

I'm not sure how we should handle this in the Syst Devel and
Ops areas. Can we talk?

Exhibit IV-2
General Model of IS Responsibilities

RESPONSIBILITY AREA	CORPORATE LEVEL	BUSINESS UNIT LEVEL	VAR*

Enterprise Planning
    Corporate Role
    Business Unit Role
	Formulate/Execute	Consult/Support
		Formulate/Execute
			▄▄

IS Policy Management
    General IS Policy
    Vendor Policy
	Develop/Enforce
	Evaluate/Select
		Participate/Enforce
		Contribute/Review
			▄▄

Technology Strategy
    Research & Development
    Architectural Standards
      - Data Base
      - Systems Development
      - Connectivity
	~~Direct Management~~ Manage
	Develop Corporate Frame-
	work in All Areas
		Participate/Contribute
		Develop Divisional Appli-
		cations Architecture
		Within Corporate Frame-
		work
			▄▄

Systems Development
    Standards/Practice
    Applications
    Utilities
	Develop/Enforce
	"Core" Systems/Databases
	Develop/Select - Maintain
		Participate/Utilize
		BU Systems/Databases
		Utilize
			▄▒

Operations
    Data Centers
    Telecom Networks
    "Back Office"
	Corporate and Utility
	Corporate Data and Voice
	Shared Function
		Divisional/Departmental
		Divisional Data
		Business Unit Processing
			▒▒

* VAR = Level of consistency in the assignment of responsibilities across all
industries.
■ - High, ▒ - Medium, ░ - Low

Exhibit IV-3
Industry/Company Specific Operational Characteristics

CHARACTERISTIC	POTENTIAL CLASSES	*MEASUREMENT*/DESCRIPTION
Nature of the Firm's Output	Information Oriented Service Oriented Product Oriented	No Physical Object Produced Physical Objects Secondary Physical Objects Primary
Extent of Contact with Consumers	Information Oriented Service Oriented Product Oriented	*High* *Mixed* *Low*
Source of Primary Transaction Volume	High Volume - External/Simple High Volume - Internal/Complex	Information/Service Oriented Product Oriented
Capital/Labor Intensiveness of Output	Asset $/Employee Revenue $/Employee Revenue $/Asset $	- - - -
Nature of Plant/Equipment	Few/Large/Fixed Location Many/Small/Easy to Move	*High* (Example: Manufacturing) *Low* (Example: Service Oriented)
Typical Organizational Structure	Functional Division/Profit Center	- - - -
Dispersion of Operations/Controls	High Low	Example: Information/Service Example: Transportation/Facilities
Nature of the Regulatory Environment	Strong Weak	Example: Banking/Finance Example: Retail Distribution

Andersen Consulting CIO contact list
   List as of 27Jun/1100hrs

Company name, name of individual
=================================

Ref Source (A=Andersen; D=RDW; M=MAG; N=NGL; P=D Peterson)
| Membership (C=CISR; R=Research Board)
| . Org Output Type (I=Information; S=Service; P=Product; E=Expert)
| . | Interv Method (M=Mail; P=Personal; T=Telephone; +=high priority)
| . | . Action (C=called; A=agreed; R=refusd; P=persist; T=telint; F=follup)

Ref	Mem	Org	Int	INDUSTRY	FIRM NAME	CONTACT	CITY	ST	PHONE	LTR	ACT	DATE/TIME	SECY NAME
P	R	I	-	Fin Svcs	Aetna Life & Cas	Sitkin, Irwin J	Hartford	CT	203/273-0771	3/20	XT	4/06:0730 (NGL)	
DP	R	S	P +	Transpt	American Airlines	Hopper, Max	Dallas	TX	817/963-2072	3/20	XT	5/03:1300 (RDW)	Carole Kristy
DN		S	P	Medical	American Med Labs	Gautney, George	Fairfax	VA	703/385-4877	3/15	XP	4/12:0800 (NGL)	
D		S	P	Transpt	American Pres Cos	Marston, James	Oakland	CA	415/272 8188	3/15	XP	4/21:1500 (RDW)	
A		I	T	Fin Svcs	Amex Trav Rel Svcs	Cupp, B Garland	New York	NY	212/640-2268	3/20	AT	7/13:1200	Joan Cammaroto: 640-5305
D		P	P	Disc Mfg	Apple Computer	Loren, Al	Cupertino	CA	408/996-1010	3/20	AP	5/03-5, when in SF	
A		S	T	Retail	ARA Svcs	Kallelis, John	Philadelphia	PA	215/238-3000	3/20	XP	3/29:0900 (NGL)	
N		E	P	Expert	Assoc for Comp Mch	Hespos, Richard	New York	NY	212/869-7440	3/20	XP	3/29:0900 (RLG)	Pat Sabatur
		I	-	Telecom	AT&T	Garrett, William	Warren	NJ	201/580-5400	3/20	XT	4/20:1300 (NGL)	
	R	I	-	Fin Svcs	Bank of America	Simmons, Michael	San Francisco	CA	415/675-1302	3/20	R	3/23 (ltr/time)	
	R	P	-	Other	Bechtel	Howard, H William	San Francisco	CA	415/768-5658	3/15	R	3/17 (ltr/time)	
D		I	P	Insur	Blue Cross (W PA)	Southworth, Charles	Pittsburgh	PA	412/255-7631	3/15	XP	4/07:1100 (RDW)	
P	R	P	-	Proc Mfg	British Petroleum	Horne, David G B	London	Eng	01/920-8000	3/20	F	4/10-f/u via U.K.office	
A		P	P	Disc Mfg	Brunswick	Murrish, Justin B	Skokie	IL	312/470-4700	3/20	XP	4/11:0830 (NGL)	
P	R	S	-	Retail	Carter Hawley Hale	Conant, R Vincent	Los Angeles	CA	714/520-1300	3/20	XP	4/03:1500 (NGL)	
P	R	P	-	Disc Mfg	Chrysler	Simonds, G Nichols	Highland Park	MI	313/956-1466	3/20	R	3/31 (secy/tel)	
DN				Fin Svcs	Citicorp	Glaser, Paul	Santa Monica	CA	213/450-4002	x	F	4/19	NY office=212/559-2948
A		P	T	Disc Mfg	Control Data	Speidel, Dennis W	Minneapolis	MN	612/853-5111	3/20	XT	3/30:1100 (NGL)	
A		P	T	Disc Mfg	DEC	Cross, Belford	Concord	MA	508/371-5464	3/20	R	4/07 (secy)	Loretta: 371-5481
A		P	T	Disc Mfg	Dexter Corp	Carpenter, Bradley	Windsor Locks	CT	203/627-9051	3/20	XT	4/03:0800 (RDW)	
P	R	P	-	Proc Mfg	du Pont	Cairns, Raymond E	Wilmington	DE	302/774-7814	3/20	XT	5/04:0800 (NGL)	
D		I	P	Insur	Equitable Life	Hughes, Lou	New York	NY	212/554-1778	3/20	XP	4/12:1300 (NGL)	
A		I	P	Fin Svcs	Fannie Mae	Alward, Samuel	Washington	DC	202/752-7000	3/20	XP	4/10:0900 (NGL)	
D		I	P	Fin Svcs	Fed Home Loan Bank	Buckner, Gary	Dallas	TX	214/541-8604	3/15	XP	4/05:0800 (NGL)	
A		I	P +	Fin Svcs	First Chicago Bank	Hollis, Donald R	Chicago	IL	312/732-3930	3/20	XP	4/11:1100 (NGL)	
A		P	P	Disc Mfg	FMC	Irwin, Dan	Chicago	IL	312/861-5820	3/20	AT	4/10:1100	
A		P	T	Proc Mfg	General Foods	Kinney, James	White Plains	NY	914/335-2003	3/20	C	4/06-JK to c/b	
		P	-	Disc Mfg	General Motors	Hill, David	Detroit	MI	313/556-5000	3/20	R	4/04 (secy)	
D		E	T	Expert	Halbrecht Assoc	Halbrecht, Herb	Stamford	CT	203/327-5630	3/20	F	4/19-RDW left msg	

Andersen Consulting CIO contact list
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Company name, name of individual
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| Membership (C=CISR; R=Research Board)
| . Org Output Type (I=Information; S=Service; P=Product; E=Expert)
| . | Interv Method (M=Mail; P=Personal; T=Telephone; +=high priority)
| . | . Action (C=called; A=agreed; R=refusd; P=persistnt; T=telint; F=follup)

Ref	Mem	Org	Int	Act	INDUSTRY	FIRM NAME	CONTACT	CITY	ST	PHONE	LTR	ACT	DATE/TIME	SECY NAME
N		E	T		Expert	Harvard Bus Sch	McFarlan, F Warren	Boston	MA	617/495-6402	3/20	XT	4/20:1015 (NGL)	
D		P	P		Proc Mfg	Helene Curtis	Gildea, Tom	Chicago	IL	312/661-0222	3/15	F	4/13:1330 (RDW)	
A		P	T		Disc Mfg	IBM	Ford, Larry	Purchase	NY	914/697-6000	3/20	F	4/12-setup appointment	Terry Rohr
Ma		I	-		Services	Info Resources Inc	Heinbach, Ned	Chicago	IL	312/726-1221	3/20	XP	4/11:1500 (NGL)	
DN		E	P		Expert	Johnson, Smith&Kni	Tollette, Skip	New York	NY	212/686-9760	3/20	XP	3/29:1100 (RLG)	
D		P	P		Disc Mfg	Levi Strauss	Eaton, Bill	San Francisco	CA	415/544-7590	3/15	R	3/22 (secy/time)	
A		P	P		Proc Mfg	Lubrizol	Sorani, Giorgio	Wickliff	OH	216/943-4200	3/20	F	4/07	
D		S	P		Other	Marriott	Yoakum, Jim	Bethesda	MD	301/380-0000	4/06	AT	5/08:1330 **reschedule	Jo Bravo
Da		I	P		Fin Svcs	Mass Mutual Life	Wallington, Pat	Springfield	MA	413/788 8411	3/15	XT	3/31:1200 (RDW)	
A		S	P		Retail	McDonald's	Dill, Carl Jr	Oak Brook	IL	312/575-3000	3/20	C	4/17-CD to c/b	
P	R	I	-		Fin Svcs	Mellon Bank	DiNardo, George P	Pittsburgh	PA	412/234-5000	3/20	XP	4/10:1330 (NGL)	
N	R	I	P	+	Fin Svcs	Merrill Lynch	Peterson, Duwayne	New York	NY	212/449-9700	3/15	XP	3/29:1630 (RLG)	
P	R	P	-		Disc Mfg	Milliken	Easterlin, Gregory	Spartansburg	SC	803/573-2020	3/20	C	4/06-tentative R/secy will f/u	
D	C	E	P		Expert	MIT-CISR	Rockart, John	Cambridge	MA	617/253-6608	3/16	C	4/03	
		P	-		Disc Mfg	Moore Business Forms	MacFarland, Mike	Glenview	IL	312/480-3000	3/xx	XT	4/20:0800 (NGL)	
D		I	P		Telecom	Pacific Telecomm	Bulgrin, James G	Vancouver	WA	206/699-5936	3/21	XT	4/04:1400 (RDW)	
P		P	-		Telecom	Pacific Telesis	Hancock, Jack	San Francisco	CA	415/823-8522	3/20	XP	4/13:0800 (NGL)	Karen Weber
D		P	P		Proc Mfg	Pennwalt	Rubin, Bob	Philadelphia	PA	215/587-7878	3/16	XT	4/06:1030	Robin
AP	R	P	P		Proc Mfg	Pepsico	Deering, Allan B	Purchase	NY	914/253-2042	3/20	XT	4/14:1030 (NGL)	
D		P	P		Proc Mfg	Petro-Canada	Sims, Tom+Twiss, CR	Calgary	Can	403/296-8390	3/20	R	3/29 (telcon w/RDW/too new in job/ltr to follow)	
A		P	P		Proc Mfg	Philip Morris	Miller, Robert J	New York	NY	212/880-5000	3/20	AT	4/xx-RJM to call when available from jury duty	
A		P	T		Disc Mfg	Polaroid	Hyland, Albert	Waltham	MA	617/684-6223	3/20	XT	3/29:1100 (NGL)	
P	R	P	-		Proc Mfg	Procter & Gamble	Herbold, Robert J	Cincinnati	OH	513/983-1100	3/20	R	3/31 (secy/not at this time)	
P	R	I	-		Fin Svcs	Prudential Ins	MacKinnon, Malcolm	Newark	NJ	201/716-6810	3/20	R	3/31 (secy/tel)	
A		P	T		Disc Mfg	Raytheon	Almeida, Robert	Lexington	MA	617/860-4727	4/06	C	4/06-secy will f/u on 4/10	Iris
P	R	P	-		Disc Mfg	Rockwell Intl Corp	Sutter, James F	Seal Beach	CA	213/797-5754	3/27	XP	4/17:1100 (NGL)	Paula
A		S	P		Retail	Safeway Stores	Davis, Roderick	Oakland	CA	415/577-3992	3/20	R	4/06 (secy/too much travel)	
D	C	P	P		Proc Mfg	Sun Co	Parrish, Ed	Radnor	PA	215/293 8288	3/15	XT	4/07:1000 (NGL)	
A		I	T		Insur	Travelers Ins	Thornton, Mary Jean	Hartford	CT	203/277-9459	3/20	XT	6/20:1000 (NGL)	Linda Henry 203/277-0581
A		S	T		Transpt	United Parcel Svce	Erbrick, Frank	Paramus	NJ	201/599-6400	3/20	XT	6/27:0930 (NGL)	Pat
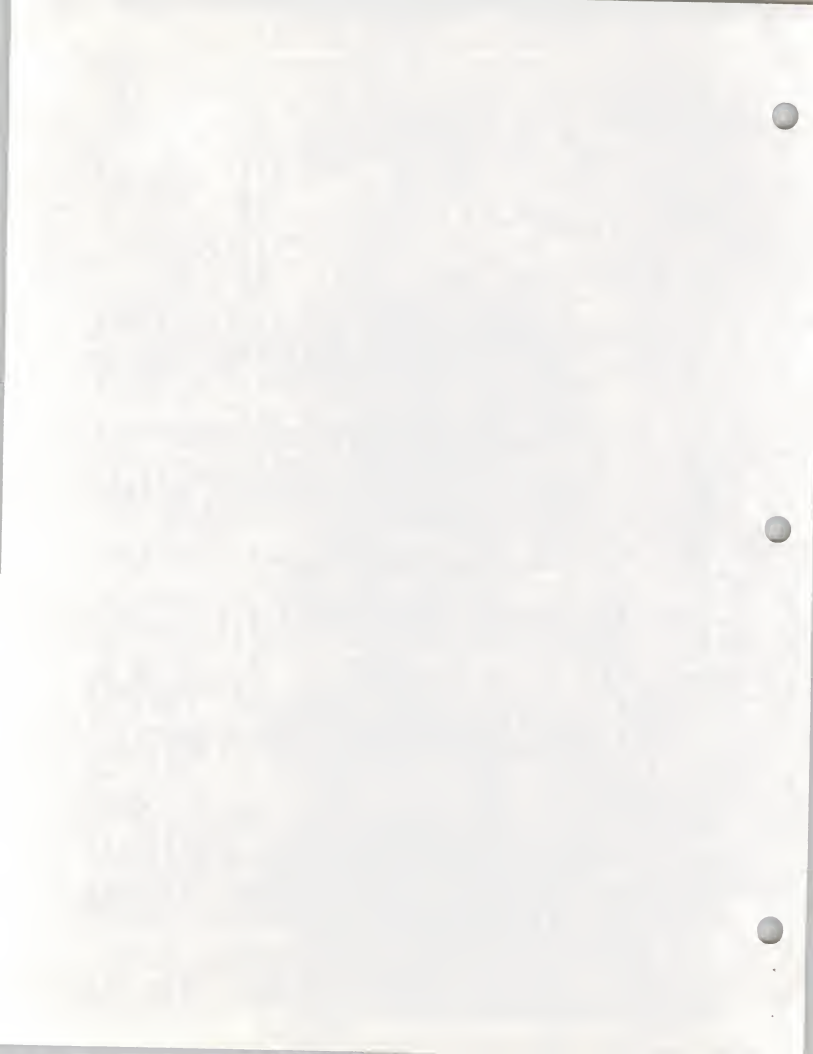
Andersen Consulting CIO contact list
  List as of 27Jun/1100hrs

Company name, name of individual
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Ref Source (A=Andersen; D=RDW; M=MAG; N=NGL; P=D Peterson)
| Membership (C=CISR; R=Research Board)
| . Org Output Type   (I=Information; S=Service; P=Product; E=Expert)
| . | Interv Method (M=Mail; P=Personal; T=Telephone; +=high priority)
| . | . Action (C=called; A=agreed; R=refusd; P=persint; T=telint; F=follup)

| . | .   INDUSTRY FIRM NAME   CONTACT   CITY   ST   PHONE   LTR ACT DATE/TIME   SECY NAME
P P - Disc Mfg United Technol Hammett, John   Hartford CT   203/728-7000 4/07 AT 4/17-f/u this week to set time   Tracy Suess
A S P Retail   Venture Stores Zerbe, Darell   O'Fallon MO   314/281-5500 3/20 AT 4/13:1300   Diana Fichter, MIS Dept
D S P Retail   Woolworth   Young, Charles New York NY   212/553-2503 3/10 R   3/23-tel/corp policy

7	Fin Svcs			11		Reject
3	Insur			---	------	-----------
3	Telecom	13	Information-oriented		13	Compl - Pers
1	Retail			33	20	Compl - Tel
3	Transpt			---	------	-----------
1	Medical				1	Agreed - Pers
1	Services			8	7	Agreed - Tel
0	Other	6	Service-oriented	---	------	-----------
7	Disc Mfg				5	Called - they will revert
4	Proc Mfg	11	Product-oriented	10	5	Followup
3	Expert	3	Expert	---	------	-----------
---				62		Total
33	Total Completed					